

FINAL REPORT

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REVIEW OF ARMY ANALYSIS

VOLUME I — MAIN REPORT

APRIL 1979

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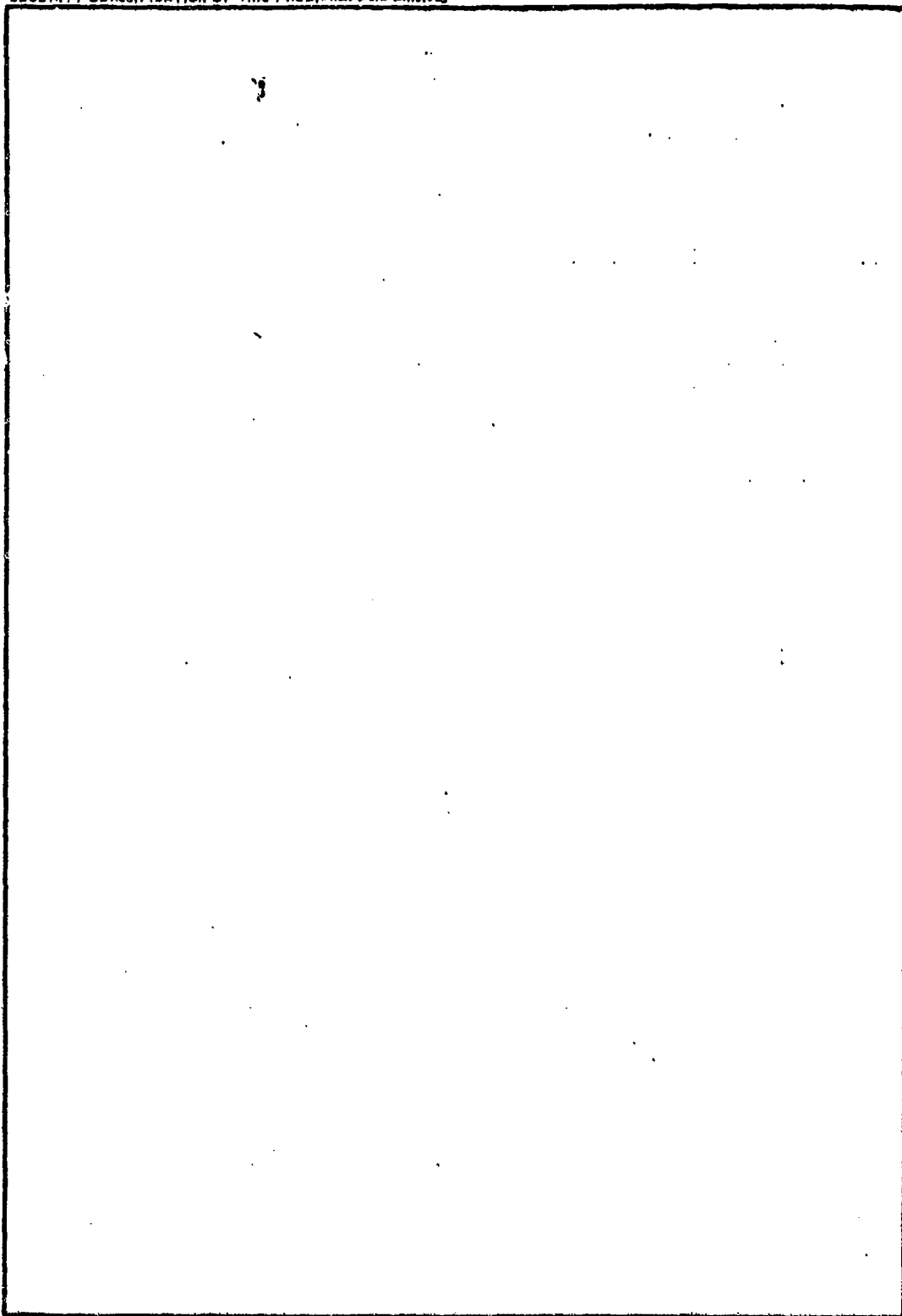
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DACS-DMO

27 MAR 1979

MEMORANDUM FOR RECORD

SUBJECT: Decisions at Meeting of Joint SELCOM (Augmented) on
"Review of Army Analysis" Study

The Joint SELCOM (Augmented) met at 0930, 22 March 1979, and made the following decisions on recommendations of the "Review of Army Analysis" study.

- a. The central thrust, philosophy and goals of the study were approved.
- b. All study recommendations were approved except for those related to the proposed Army Study Council and the numbers of, and transfers of personnel resources; decision on recommendations on sources and numbers of analytical personnel was deferred pending review by DM and DAS. Upon completion of review, DAS will present revised recommendations to PBC prior to referring to VCSA for decision.
- c. A new Army Study Council was not approved. Instead, the Joint SELCOM (Augmented) will review and approve study guidance and programs.
- d. Concepts Analysis Agency (CAA) will be assigned to the DAS and will provide analytical support to the total HQDA Staff. It will have an enlarged mission including conduct of personnel/manpower and logistics analyses. It will use the HQDA study funds (historically approximately \$4M annually). Commander, CAA will review resource requirements for the enlarged mission (including the added contract funds), and report added personnel requirements to the DAS.
- e. The increase of analytical capability at CACDA was approved. Commander, TRADOC will review the enlarged CACDA mission and recommend to HQDA the numbers of analysts required at CACDA to support the expanded mission.
- f. The Study Program Coordination Committee (SPCC) was approved as a subcommittee of the SELCOM, to function within the usual PPBS channels.

67 MAR 1979

DACS-DMO

SUBJECT: Decisions at Meeting of Joint SELCOM (Augmented) on "Review of Army Analysis" Study

g. The enlarged Study Program Management Office (SPMO) was approved. The SPMO will have a civilian supergrade chief. The supergrade space will be provided from ODUSA(OR). The enlarged SPMO should become operational as quickly as possible.

h. The DAS review will also include a recommendation as to the sources of analytical spaces to satisfy the ODCSPER requirement for 9 analysts at the AWC and 18 at ODCSPER.

i. The role and resources of the Engineer Study Center will be reviewed by the DAS; mission of ESC will be focused on analysis in direct support of Engineer peculiar studies.

j. Every effort will be made to avoid strength increases in NCR. DM will develop justification for adding any spaces in NCR.

k. All of the above actions will proceed as expeditiously as possible, consistent with prudent management, in order to realize the recommended improvements in the study and analysis community.


J. PAUL DUNN

Chief, Study Management Office
Management Directorate

27 Mar 79 - Approved VCRA.


WILLIAM A. HUSSONG, JR.

Major, GS
Assistant to the Director
of the Army Staff

REVIEW OF ARMY ANALYSIS

VOLUME I - MAIN REPORT

April 1979

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SPECIAL STUDY GROUP
DEPARTMENT OF THE ARMY
Washington, DC 20310

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CHAPTER 1

INTRODUCTION

1-1. PURPOSE. This report was prepared by a Special Study Group under the cognizance of the Deputy Chief of Staff for Operations and Plans (DCSOPS), Headquarters, Department of the Army (HQDA). The group was charged with reviewing the analysis capabilities of the Army and proposing practical improvements to those capabilities.

a. The HQDA special study resulted directly from discussion between the Under Secretary of the Army (USofA) and the DCSOPS. Earlier discussions regarding the need for a review of Army analysis capabilities had involved several other persons at the Army Staff and Secretariat levels.

b. From the outset of the discussions, there has been acceptance of the view that quality analysis capability is of continuing importance to the Army. However, since the Army has only limited resources to do analysis, it also is important that they be used wisely. This requires that the analysts work on the right problems, use the most powerful methods of analysis, and produce results which are valid and credible. The call for a Special Study Group review of Army analysis was based on the belief that improvements are needed and that opportunities for such improvements can be found.

c. A tasking memorandum by the USofA (Appendix M) provided the parameters and guidance under which the study was conducted. It encouraged examination of the broad aspects of the use of analysis in the Army, but the clear aim was to stimulate specific improvements.

1-2. BACKGROUND. a. The current organization and structure for conduct of analysis within the Army has existed for the approximately five years since the 1973 reorganization of major continental US commands of the Army. The one major exception to this was the establishment of the US Army Training and Doctrine Command Systems Analysis Agency (TRASANA) at White Sands Missile Range, New Mexico, in 1974. During the past five years, there has been no overall appraisal of the extent to which the current Army analysis structure is actually functioning as planned. Responsible authorities of the Army have sensed that it now is appropriate to examine Army analysis and determine whether the current structure, policies, and practices should be modified.

b. The call for a review of Army analysis was based on more than just a philosophical commitment to good management. It was, in addition, an outgrowth of a fairly widespread impression that the quality and credibility of Army analysis is less than desired. Some examples cited have included criticisms such as the following:

(1) Several cost and operational effectiveness analyses have required second efforts.

(2) Cost and schedule projections of acquisition programs have not been uniformly accurate.

(3) Performance of hardware item systems often has not been analyzed in a sufficiently representative set of battlefield conditions.

(4) Quality and value of some of the human resources related studies have been marginal.

(5) Obvious alternatives to significant proposed changes to Army organizations, such as that to increase the artillery structure of Army divisions apparently have not been analyzed well.

(6) Alternatives to major force structure change proposals, such as conversion of light divisions to heavy divisions, apparently have not been analyzed well.

c. In a more general sense, concerns have also been expressed that the highly decentralized management of Army analysis resources may be resulting in analysts not working on the most fruitful problems. For example, some persons believe that too few Army analysis resources are being used to assess matters such as near-term operations of forces in the field, training methods, tactical concepts, operations in a chemical or nuclear environment, logistical support operations, and manpower management. Conversely, the high cost hardware systems are thought to have received too large a share of analysis attention. Thus, the content of the Army studies and analysis program has been of special interest.

d. An additional issue has been the eroding of Congressional support for funding of analytical programs. The request for funds to support the Department of Defense (DOD) studies and analysis activities has been a matter of increasing interest and attention within the Congress. The FY 79 appropriations are substantially below the funds requested in the President's Budget. Whether or not this situation has resulted from programs which were poorly conceived and presented is unclear and requires review.

1-3. ASSUMPTIONS. The following assumptions were made at the beginning of the review.

a. The organizational structure and missions of the HQDA and major commands (MACOMs) will remain unchanged for the foreseeable future.

b. The personnel resources and funds made available for conduct of Army studies and analyses will not be substantially increased in the foreseeable future and may, in fact, be decreased.

c. The balance of analysis responsibilities and access to the use of study and analysis resources among the Army Secretariat, Army Staff, and MACOMs can be changed to only a limited extent and only with sound justification.

d. Major reorganizations or extensive personnel relocations cannot be effected unless clearly justified by an expected increase in effectiveness.

1-4. METHODOLOGY. a. Review Team. The Special Study Group assembled by DCSOPS for the Review of Army Analysis was chaired by the Deputy Under Secretary of the Army (Operations Research) (DUSA(OR)). The DCSOPS representative was the Technical Advisor to the DCSOPS. Full-time representatives were provided by ODCSPER, OCOA, HQ TRADOC, HQ DARCOM, and the four major analytical organizations of the Army--Concepts Analysis Agency (CAA), Combined Arms Combat Developments Activity (CACDA), TRADOC Systems Analysis Activity (TRASANA), and Army Materiel Systems Analysis Activity (AMSAA). Part-time assistance was provided by a number of other Army elements. A complete list of contributors is given in Appendix A. The Review Team was convened in the Pentagon on 25 July 1978 and remained in operation until 29 September 1978.

b. Approach. The basic approach taken by the Review Team can be described in four general steps: definition of the analytical community of the Army; definition of a concept of what Army analysis should be, description of what the Army analysis community currently is and does to include perceptions, facts, and the Study Group assessment of these, and comparison of the current practices with the conceptual or idealized practices to develop findings and objectives/solutions/actions for improvement. Each of these four steps is discussed below.

(1) Definition of Analytical Community. Those Army elements which have operations research study and analysis functions or which contain operations research study and analysis resources were identified as candidates for inclusion in the Army analysis

community. How analysis relates to the mission of each of the elements was assessed, and characteristics of the overall analysis community were developed. Results of this step of the review are outlined in Chapter 2.

(2) Development of Analysis Concept. Considerable work of the review team was devoted to developing a conceptual or idealized framework of Army analysis which could serve as a standard reference model of the nature and structure of what Army analysis should be. The concept is presented in detail in Chapter 3. The present state of practice of the Army analysis community was then compared with this reference model, and a number of desirable changes to the present orientation, resources, tools, and organizations of the Army were identified.

(3) Description of Current Community. The Review Team also devoted considerable effort toward developing an understanding of the nature of the current Army analysis community. Basic data collection efforts were undertaken as follows:

(a) Perceptions Data. Over 100 knowledgeable individuals were interviewed or surveyed regarding strengths and weaknesses of Army analysis. Conducted very early in the review, this effort developed perceptions which were used to focus the other data collection efforts and to structure study areas for further analysis. Chapter 4 summarizes these perceptions, and Appendix C provides added detail.

(b) Resources Data. To inventory the Army's analysis resources, a detailed questionnaire was administered to 74 organizational elements of the Army. Data collected included personnel age, skill and experience, organization resources, and nature of present and future work programs. Much of these data were processed through computer programs for statistical analysis. An extensive treatment of the survey data is presented in Appendix D.

(c) Special Topics. A third data collection effort involved specialized investigations of certain topical areas. These included the status of manpower and personnel studies in the Army; an in-depth review of how the Army study program is assembled and justified; an examination of the current organizational arrangement of Army analysis resources; the current utilization of military analysts (SC 49); and an exploration of budget strategies. Appendixes E through I report on these special topics in detail.

(d) Other Data Collection. In addition to the formalized data collection actions outlined above, one-day to two-day visits were made by members of the team to the AMSAA, CAA, CACDA,

Logistics Evaluation Agency (LEA), and the Army Strategic Studies Institute (SSI). Briefings were received by the Review Team from the Engineer Studies Center (ESC), the Army Research Institute (ARI), and several organizations currently involved in the development of new or improved simulation tools.

(4) Development of Findings. As the final step of the study, the perceptual data concerning strengths and weaknesses (paragraph (3)(a) above) were analyzed and compared to data collected concerning the actual nature of analysis (paragraph (3)(b) through (d) above). Based on this comparison, a determination was made as to whether each of the perceptions correlated to actual situations. A large number of the perceived weaknesses were found to be borne out by facts. Several perceptions were proven to be unfounded. In a number of cases, it was not possible to obtain either quantitative or qualitative information to validate the perception. For those validated weaknesses which appeared to be most serious, corrective alternatives were developed, their pros and cons were argued, and the preferred corrective actions are proposed. Corrective actions being recommended were tested against perceived strengths to assure that if implemented, the change would not detract from the positive attributes of the community. Because this entire process of developing recommended changes and improvements was largely judgmental in nature, the recommendations were discussed with a number of principal Army managers whose organizations would be affected in order to broaden the base of views considered by the Study Group. Chapters 5 through 15 contain the discussion regarding the development of findings and proposed actions.

c. Tasks and Schedules. Figure 1-1 describes the scheduling of the major activities of the Review Team.

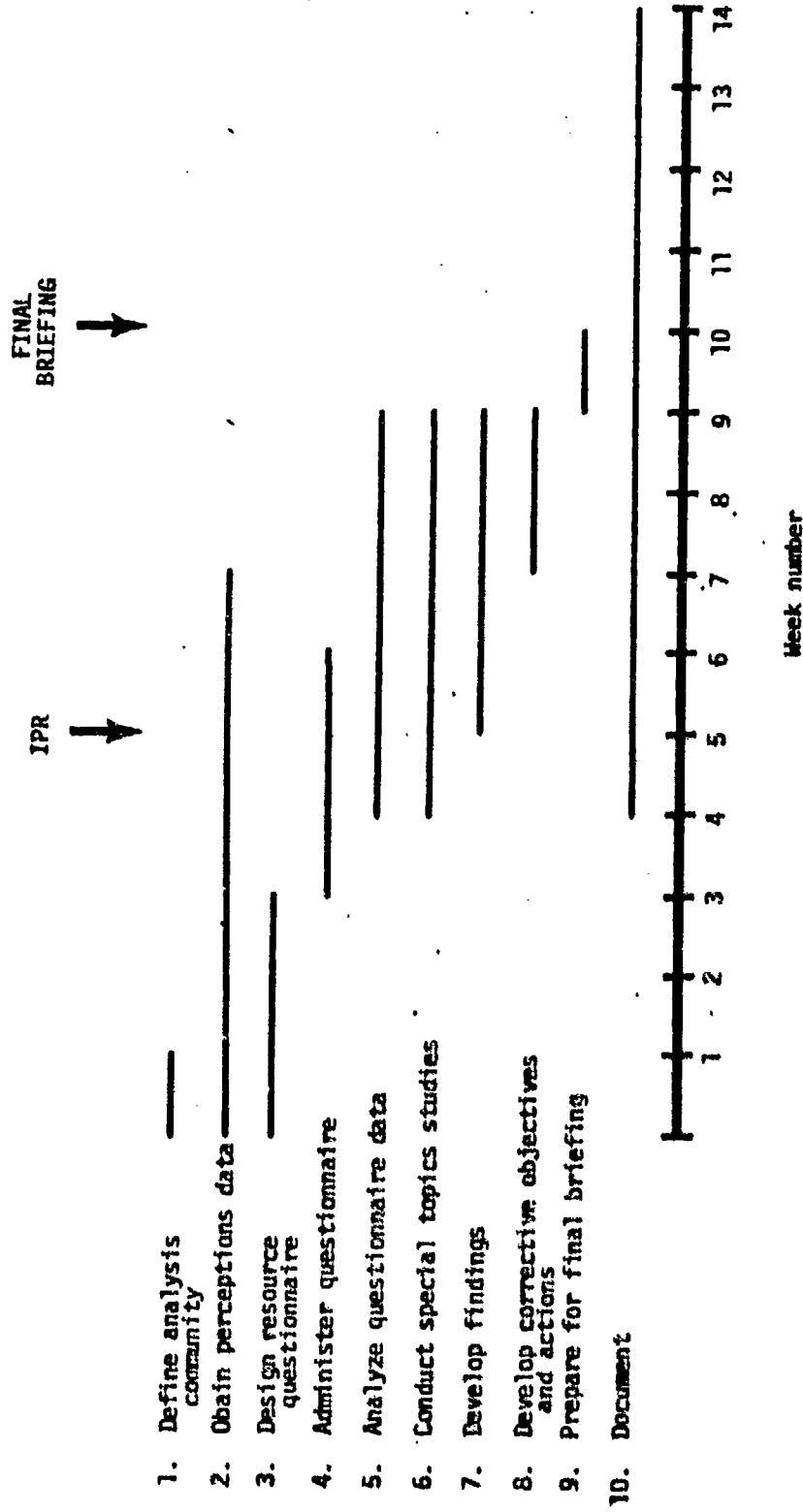


Figure 1-1. Task and Schedule Layout

CHAPTER 2

THE ARMY STUDIES AND ANALYSIS COMMUNITY

2-1. DEFINITION. In order to define and describe the studies and analysis community, the basic terms--"studies" and "analysis" must first be defined. Integral to these definitions are two other key terms which must be understood--"operations research" and "system." The definitions of these four terms (Figure 2-1) provided the basic framework for the definitive review of the community and the assessment of its characteristics.

2-2. ROLE OF ARMY OPERATIONS RESEARCH, STUDIES, AND ANALYSIS. Operations research, studies and analysis can be viewed as having the role shown in Figure 2-2. To understand the role of studies and analysis from an Army organizational and functional viewpoint, the differentiation between "studies and analysis" and "research" must be understood. This differentiation is basically one of emphasis since the aim of both processes is to generate information either as a base for decisionmaking or to identify avenues for additional efforts. A description of the differing emphasis is shown in Figure 2-3.

2-3. STUDIES AND ANALYSIS WITHIN THE ARMY. a. Prior to 1973, studies and analysis within the Army had a basically centralized control structure. Most analytical resources were concentrated within two major commands--the Combat Developments Command and the Army Materiel Command. With the 1973 reorganization, a more dispersed approach to control of resources was introduced. There was a belief that studies and analysis should be viewed as an integral part of the decisionmaking process as opposed to a separate function. Thus, today analytical resources are found throughout the Army in varying degrees.

b. There are varying definitions of what organizational elements make up the studies and analysis community. The studies reported under AR 5-5, The Army Study System, are primarily those of HQDA Staff agencies, CAA, TRASANA, the TRADOC schools and centers, and the SSI. The study team recognized though that there are analytical activities in a number of other organizations--namely, ARI, Battlefield Systems Integration (BSI), ESC, LEA, US Army Nuclear Chemical Agency (USANCA), Research Development and Acquisition Information Systems Agency (RDAISA), Military Personnel Center (MILPERCEN), and study elements of Materiel Development and Readiness Command (DARCOM) commands and the operational commands. An even broader viewpoint (e.g., within Congress) considers the community to include cost analysis activities, some portions of

STUDY	- A CAREFUL EXAMINATION OF A PHENOMENON, DEVELOPMENT OR QUESTION
ANALYSIS	- AN EXAMINATION OF A COMPLEX, ITS ELEMENTS, AND THEIR RELATIONS.
OPERATIONS RESEARCH	- THE APPLICATION OF SCIENTIFIC AND ESPECIALLY MATHEMATICAL METHODS TO THE STUDY AND ANALYSIS OF PROBLEMS INVOLVING COMPLEX <u>SYSTEMS</u> (AS FIRM MANAGEMENT, ECONOMIC PLANNING, AND THE WAGING OF WAR).
SYSTEM	- REGULARLY INTERACTING OR INTERDEPENDENT ITEMS FORMING A UNIFIED WHOLE.

Figure 2-1. Basic Definitions

ANSWER QUESTIONS (AND SOMETIMES ASK THEM)

SOLVE PROBLEMS (AND SOMETIMES IDENTIFY THEM).

ILLUMINATE ISSUES (AND SOMETIMES DEFINE THEM).

THE AIM: INCREASE UNDERSTANDING, NOT TO DECIDE.

Figure 2-2. Role of Army Operations Research, Studies and Analysis

"RESEARCH" USUALLY--	"STUDIES AND ANALYSIS" USUALLY--
CONCERNED WITH TECHNICAL QUESTIONS	CONCERNED WITH PROBLEMS
USES METHODS OF (1) SCIENCE (2) QUANTITATIVE ANALYSIS	USES METHODS OF (1) QUANTITATIVE ANALYSIS (2) SCIENCE
INVOLVES EXPERIMENTATION AS WELL AS USE OF AVAILABLE DATA	USES AVAILABLE DATA BUT OFTEN REQUIRES EXPERIMENTATION
AIMS TO GENERATE NEW FACTS AND LAWS	AIMS TO SOLVE PROBLEMS AND ILLUMINATE ISSUES
GENERATES INFORMATION THAT MAY BE USEFUL IN STUDIES	UNCOVERS INFORMATION GAPS SUITABLE FOR RESEARCH EFFORTS

Figure 2-3. "Studies and Analysis" are Much Like
"Research" but Differ in Emphasis

Ballistics Research Laboratories (BRL), test activities, base operations and facilities planning, energy technology assessments, Surgeon General studies, and various other research activities.

c. The review team had considerable difficulty in determining whether cost analysts, analysts who support test activities, and analysts who work in the several Project Manager's (PM) offices should be included in the tally of resources. In the end they were not included. Cost analysts usually are considered part of the financial management community rather than the studies community. The review team encountered some criticism of cost analysis within the Army, but had insufficient time to research the causes--it thus decided to exclude rather than include without corrective actions. (Selected information on cost analysis efforts was obtained, however, and is available for later analysis if desired.) Exclusion of the analysts who work at TECOM, TCADA, CDEC, OTEA, and the TRADOC Boards was based on the conclusion that it is questionable that their activities in test planning, data reduction, report preparation and similar activities is related to studies as much as it is to testing. The final exclusion--analysts who work in PM offices--was in a sense inadvertent. The work of these persons is not unlike that of the analysts who work in the DARCOM Commodity Commands, except that it is of a narrower scope. No data on the number of such persons was collected, but it is thought to be less than a few score.

d. Table 2-1 and Figure 2-4 summarize the community as defined by the Study Group.

2-4. PERSONNEL RESOURCES. Studies and analysis personnel resources are dispersed throughout the Army as shown in Figures 2-5 and 2-6. From Figure 2-6 it can be seen that the resources are fairly evenly divided among three organizational groupings--TRADOC, DARCOM, and all others. Within each group, the preponderance of resources can be found in one or two organizations with a low level of resources being located in the operational commands. Within the HQDA Staff and supporting organizations component of the community, over 60 percent of the resources are assigned to the CAA and the ARI. Within TRADOC, 203 of the 738 personnel spaces are assigned to TRASANA. About one-third of DARCOM's analysis resources are located at AMSAA and one-third within various research and development (R&D) commands. Less than 1 percent of the total analytical resources are assigned to two of the major operational commands, FORSCOM and USAREUR.

2-5. FUNDING. The Army's funding experience for FY 78 for the community as defined by this review included approximately \$139 million related to studies and analysis (see Figure 2-7). The

Table 2-1. Army Studies and Analysis Community Organizations
(page 1 of 2 pages)

HQDA

Office Deputy Under Secretary of the Army (Opns Research)
Study Management Office, OCSA
Technical Advisor Office, ODCSOPS
System Review and Analysis Office, ODCSRDA
Advisor for Research, Development and Acquisition,
ODCSRDA
Research and Studies Office; Human Analysis Team, ODCSPER
Study Management Office, ODCSLOG
Red Team, OACSI
Program Analysis and Evaluation, OCSA

SSA/FOA

Strategic Studies Institute
Concepts Analysis Agency
Army Nuclear and Chemical Agency
Army Research, Development and Acquisition Information
System Agency
Logistics Evaluation Agency
Army Research Institute
Military Personnel Center
Army Recruiting Command
Engineer Studies Center

Major Commands

US Army Europe
US Army Intelligence and Security Command
US Army Communications Command
US Army Forces Command

US Army Training and Doctrine Command

DCS, Combat Development--Analysis Directorate
TRADOC Systems Analysis Activity
Combined Arms Combat Development Activity
Logistics Center
Admin Center

Table 2-1. Army Studies and Analysis Community Organizations
(page 2 of 2 pages)

Schools/Centers

Armor
Artillery
Air Defense
Infantry
Aviation
Engineer
Transportation
Quartermaster
Missile and Munitions
Intelligence
Signal
Military Police
Ordnance and Chemical

US Army Materiel Development and Readiness Command

Battlefield Systems Integration Directorate
Systems Analysis Division
Armament Materiel Readiness Command
Communications and Electronics Materiel Readiness Command
Missile Materiel Readiness Command
Tank-Automotive Materiel Readiness Command
Troop Support and Aviation Materiel Readiness Command
Armament Research and Development Command
Aviation Research and Development Command
Communications Research and Development Command
Electronics Research and Development Command and Harry
Diamond Laboratories
Mobility Equipment Research and Development Command
Missile Research and Development Command
Natick Research and Development Command
Tank-Automotive Research and Development Command
US Army Materiel Systems Analysis Activity
US Army Management Engineering Training Agency
Depot System Command
Inventory Research Office
Logistics Studies Office
Logistics Control Activity
Security Assistance Center
Procurement Research Office

HEADQUARTERS ELEMENTS

ARMY SECRETARIAT	-	7
HQDA STAFF	-	35
HQ TRADOC	-	25
HQ DARCOM	-	7
		<u>74</u>

STRATEGIC STUDIES

SSI	-	35
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OR/SA STUDIES OF SYSTEMS

OPERATIONAL COMMANDS	-	28
CAA	-	185
TRADOC CENTERS (3)	-	200
TRADOC SCHOOLS (12)	-	310
TRASANA	-	203
AVSAA	-	320
		<u>1246</u>

SCIENTIFIC/ENG STUDIES OF ELEMENTS OF SYSTEMS

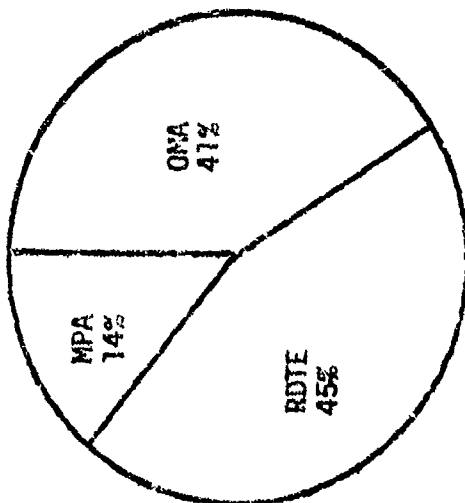
USAREC	-	10	}	PEOPLE
ARI	-	247		
MILPERCEN	-	48		
LEA	-	15		LOGISTICS
USANCA	-	14		NUCLEAR
BSI	-	13	}	HARDWARE
DARCOM ORGS.	-	556		
RDAISA	-	48		R&D INFO
ESC	-	34		ENG PLANS
		<u>989</u>		

Figure 2-4. The Army Study Community (Number of professional personnel on-hand)

ESTIMATED COST

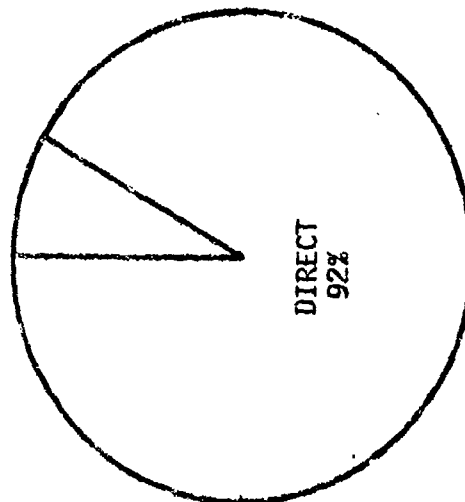
\$139 M

INDIRECT
8%



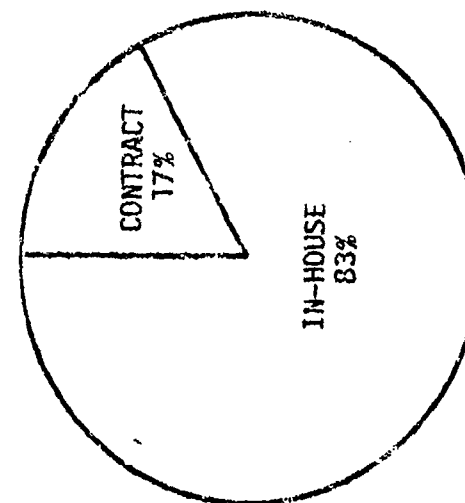
APPROPRIATION

MPA 19
OMA 57
RDTE 63



FUND SOURCE

DIRECT 128
INDIRECT 11



METHOD OF PERFORMANCE

IN-HOUSE 115
CONTRACT 24

Figure 2-7. Estimated Costs (based on FY 78 data)

major portion of this (46 percent) was from the Research Development Test and Evaluation (RDTE) appropriation; 38 percent was Operations and Maintenance, Army (OMA); and 16 percent was Military Personnel, Army (MPA). Eighty-three percent of these funds was applied to in-house studies with 17 percent (or \$24 million) used for contractual support.

2-6. CHARACTERISTICS. To summarize from a resource standpoint, the analytical community has three basic characteristics: it is dispersed throughout the Army; it includes a variety of organizations ranging from agencies which do nothing but studies and analysis and organizations (such as the operational commands) who have very little studies capabilities; and it is mainly an in-house function with only a small fraction of the resources being used to support contracts.

CHAPTER 3

A CONCEPT OF ARMY ANALYSIS

3-1. GENERAL. This chapter describes a conceptual framework of the nature and structure of Army analysis.

3-2. ARMY SYSTEMS. a. For this discussion, a system is defined as "trained people using things to accomplish objectives in environments that may include opposing elements." It follows directly from the definition that a system includes the elements of personnel, training, doctrine and tactics, hardware (and software), mission, environment, and threat.

b. In accordance with this definition, the smallest collection of these elements which can constitute a system is called the item system. Example of item level systems are: an individual tank with crew; a manned PATRIOT fire unit; a BLACKHAWK helicopter with crew. Item systems are combined together into units (Table 3-1) to create higher level systems for combat within which the item systems work together to accomplish the objectives or missions of the unit. Item systems are also grouped into functionally integrated systems which cut across combat organization levels for purposes of control and efficiency. Examples are the air defense functional system, the surveillance/intelligence functional system, or the fire support functional system. Units and elements of functional systems are combined to form major organizations such as brigades, divisions, and corps. Major organizations are combined to form forces.

c. Figure 3-1 is a description of the makeup of a small combined arms team, usually a battalion-sized task force. Its primary activities are to maneuver and to service enemy targets, and for these purposes it contains groups of item level systems such as tanks, APC, antitank guided missiles, infantry units, and attack helicopters. While the main activities are maneuver and target servicing, several other activities must also be enabled. These are reconstitution of the battalion task force after it suffers losses during a battle and movement of the battalion task force into the battle area and from one battle to another. The remaining seven functions support the task force in its combat operations. Each support functional system is itself comprised of item systems or groups of item systems either attached to the task force or providing services to it from a higher level in the organizational hierarchy.

Table 3-1. System Levels

Level	Description
6	Total Army
5	Theater force
4	Major organization (brigade, division, corps)
3	Vertically integrated functional system (air defense, intelligence, fire support)
2	Combined arms and support battle group (company team, battalion task force)
1	Item system (tank, helicopter, howitzer)

d. In Figure 3-2, combined arms task forces are the building blocks of the division organization, usually through a brigade commander for span of control purposes. The division organization objective is similar to the battalion task force, differing mainly in scale. The same support functions are appropriate and are enabled by item level systems or groupings, some of which are unique to the division and some of which may be provided from the corps level. Similarly, divisions are the building blocks of the corps organization where the same concepts apply.

e. Figure 3-3 illustrates Army organization for combat at the theater of operations level. The primary combat objective of enemy target servicing, the associated capabilities to build/rebuild forces and to move, and the seven combat support functions are pertinent to every level of combat organization. The combat support functions are themselves systems which are each comprised of item level systems and are internally organized in a vertical manner that crosses levels of combat organization. Thus it can be seen that the Army organization for combat has elements of a classical matrix organization.

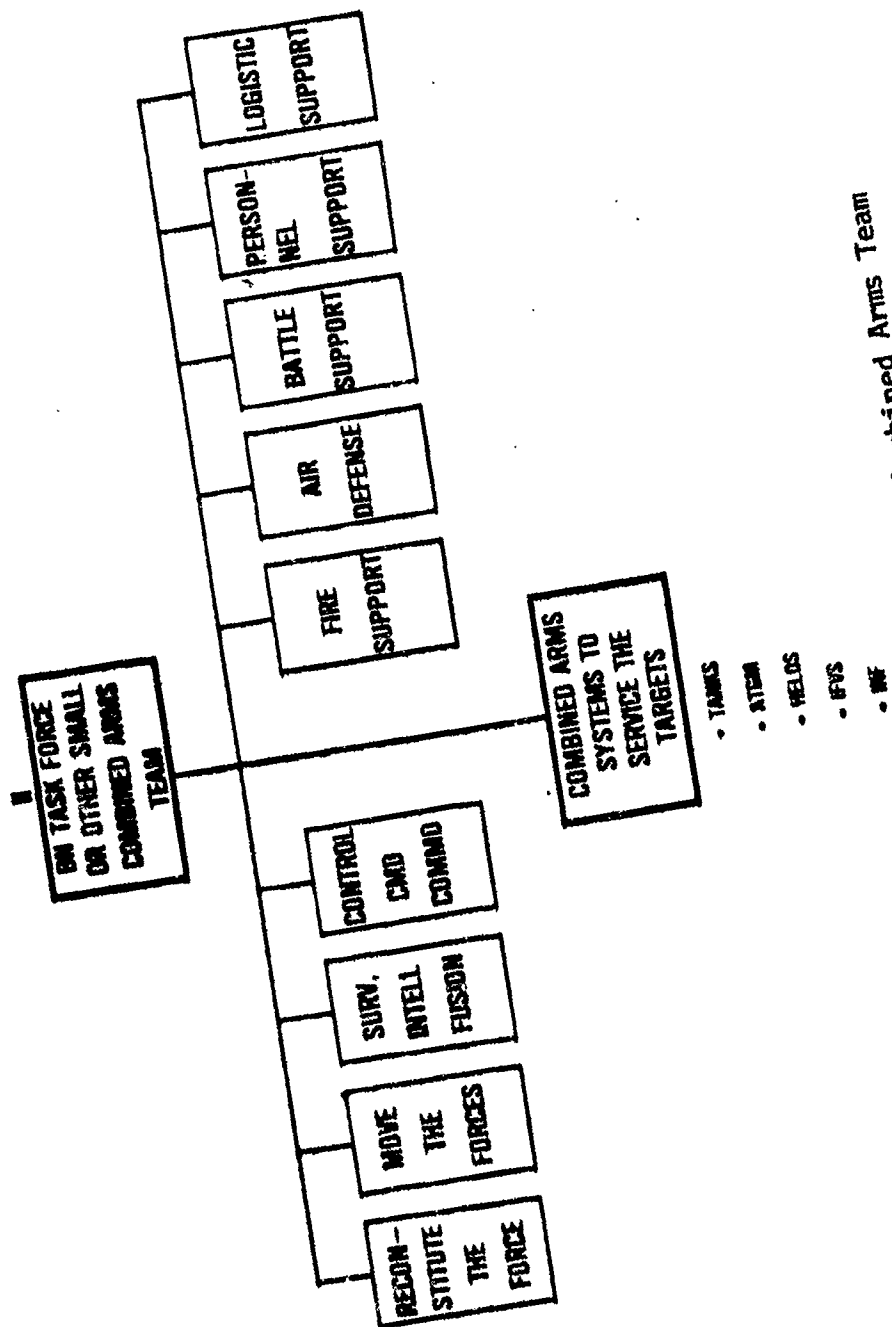


Figure 3-1. Makeup of Small Combined Arms Team

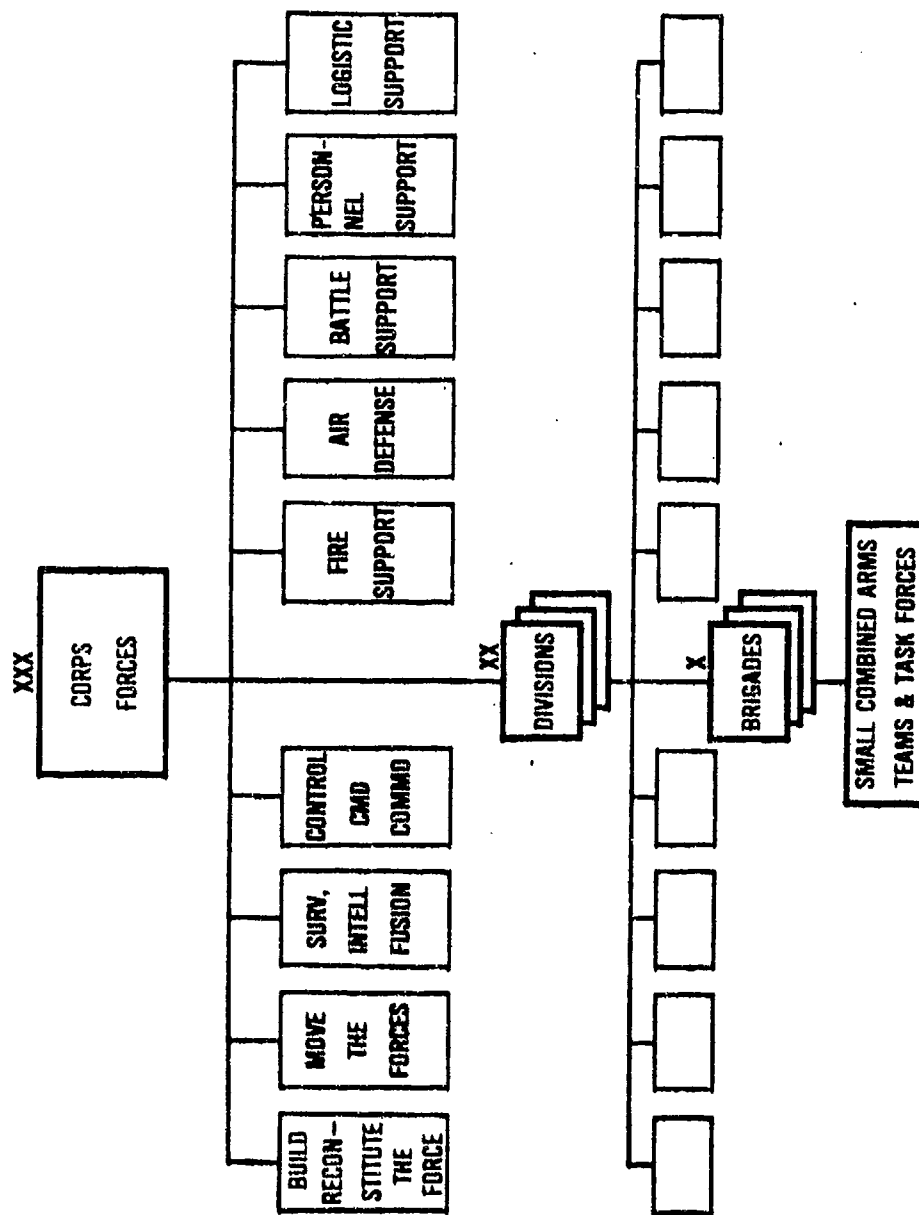


Figure 3-2. Division Organization Building Blocks

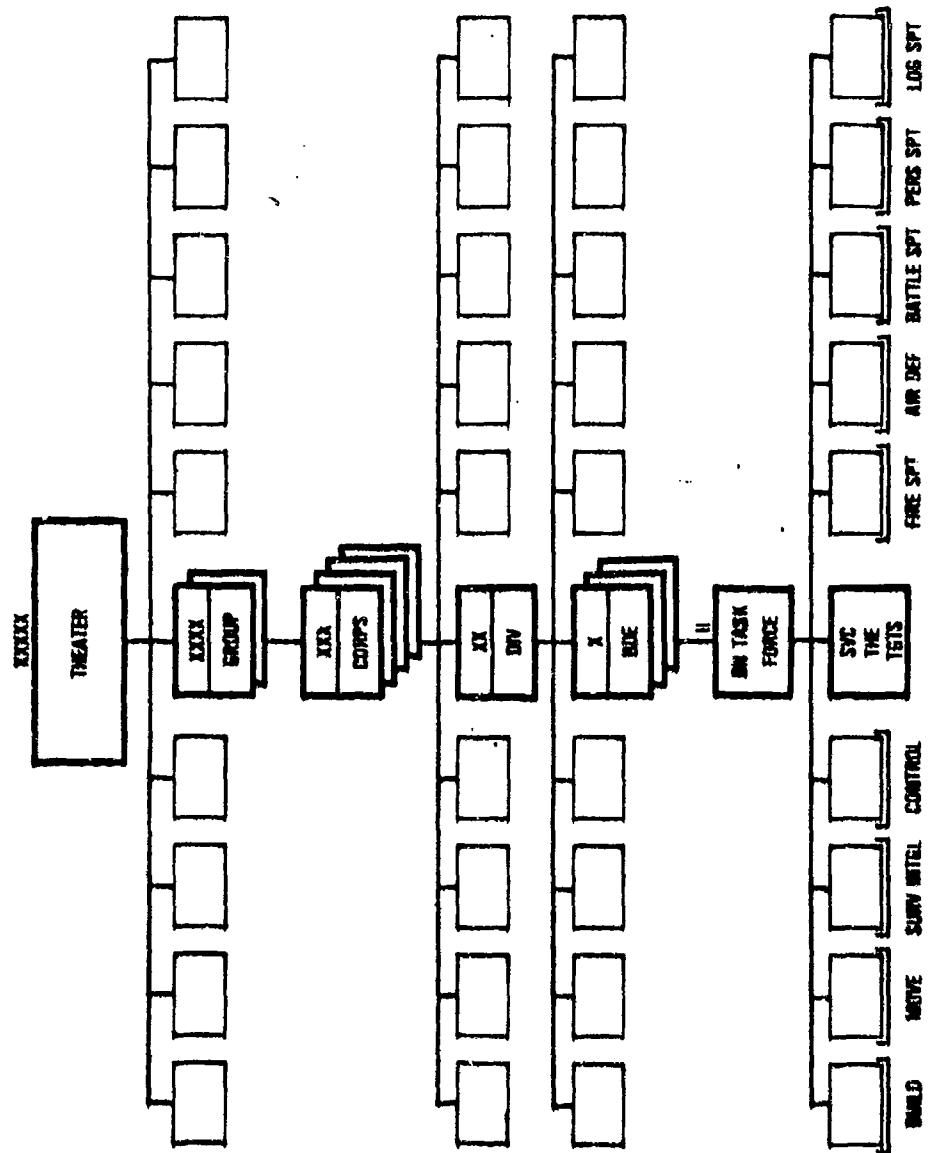


Figure 3-3. Theater-level Organization for Combat

3-3. DEMANDS FOR SYSTEMS ANALYSIS. a. At every level of the combat organization hierarchy, it is appropriate to ask the following five questions:

(1) Is there a need for a new, modified, or reduced class of system?

(2) If so, what are the desired characteristics or attributes?

(3) Which is the preferred alternative for achieving these characteristics?

(4) How will the new or modified element be employed (organization, doctrine, tactics), supported and trained?

(5) What quantity is required?

Most of the issues facing the Army with regard to its combat structure can be described by one or more of these five questions. The first two questions deal with identification of deficiencies and development of requirements. The third deals with cost and benefit tradeoffs among the possible solutions. The fourth addresses operational employment concepts, support, and training of personnel. The fifth deals with force levels or bases of issue.

b. At the topmost level of the hierarchy shown in Figure 3-3 (army/theater), the design questions (issues) typically involve force balance, force quantity, and organization. At this level, the combat service support systems connection with CONUS is most visible and the demands for combat consumables are most appropriately aggregated. Resources are multi-service.

c. At the corps/division levels, the issues typically concern quantity and balance of units and the tactics of their employment in battle. The corps and division are the fusion points for intelligence data regarding the disposition and constitution of enemy forces.

d. The battalion task force organization is, for practical purposes, the lowest level at which item level systems are organized to create a combined arms force capable of engaging in combat. Consequently, the battalion design issues concern not only the quantity and mix of the elements but the performance capabilities of the item systems of which it is comprised. The tactics of close combat are also developed within the context of the battalion task force.

e. Still referring to Figure 3-3, each of the vertical functional systems results in a demand for systems analysis distinct from the demand imposed by the combined arms organizational hierarchy. The functional groupings are, in fact, a way to decompose the complex combined arms analysis problem into pieces more tractable for analysis (with the usual risk of ignoring important interactions among functions). This view of the Army as sets of item systems, each set oriented to perform a given function, has been convenient for analysis purposes since it somewhat matches the Army branch materiel structure and because the analysis of item system interactions within a functional system is in some ways less complex than is the analysis of interacting functions across a combat organization. Within a functional system, the same five basic design questions prevail as stated in 3-3a above. Within a functional system, the design and operational issues are the same as with combat organizational levels; namely, vertical balancing between quantities and characteristics of the item systems which comprise the functional system and tactics of employment of the item systems.

f. Another dimension to be considered when sizing the analysis demand involves the timeframes of interest to the designers and evaluators of Army combat forces.

(1) Issues of adequacy of current forces and operations tend to span the time period from the present to perhaps two or three years in the future. The combat settings, threats, scenarios, forces, and tactics studied by the analysis community are appropriate to this time period.

(2) The time period extending from two to perhaps ten years in the future is of interest for analysis because most of the new systems currently in the acquisition cycle will reach operational status in that timeframe. The requirements for these developmental systems were established on the average about five years ago. At that time, the analysis supporting the requirement was conducted in a setting which anticipated fielding of the system about ten years in the future and employed the best known force constraints, threat forecasts, and scenarios which were then available. With the passage of time, these factors change, and development programs undergo repeated review against the updated constraints, threat forecasts, and postulated scenarios which are better known as the time for fielding a system draws nearer.

(3) Timeframes set about ten years or more in the future are of interest in studies leading to the establishment of requirements for new systems and force postures.

g. Viewed from the analyst's standpoint, the demands for analysis activity surrounding the design and operation of combat forces represent a broad spectrum of problems involving a variety of complex interacting systems operating in many environments to accomplish a variety of combat missions against a spectrum of enemy forces. Figure 3-4 is a schematic of a battalion task force in combat position which makes this point. For a scenario of this complexity to be understood, it is essential that a strong, coordinated process of evaluation be available to the analysis community.

3-4. AN IDEALIZED ANALYSIS STRUCTURE. a. The Army analysis community has wrestled with the issues described in the preceding section with ever-increasing dependence on the tools of operations research over the past years. Certain classes of evaluation have become sufficiently well recognized and are considered so essential that Army regulations make them mandatory. For instance, in the regulations dealing with acquisition of new materiel, a requirement exists for tradeoff analyses within the design of a new item level system as well as a formalized evaluation leading to the selection of the best technical approach to the satisfaction of a new technical requirement (AR 70-1). Another regulation, AR 1000-1, requires that for each major decision milestone in the acquisition cycle of new materiel a cost vs benefit analysis be conducted which compares the developmental item system with alternative systems for accomplishing the requirement. This class of evaluation is the well-known Cost and Operational Effectiveness Analysis (COEA). These required studies are addressed almost exclusively to item level hardware systems. Similar Army-wide regulatory requirements do not exist for studies and evaluations of new doctrine or tactics, new training programs, or changes to the composition and mix of combat or combat support forces. However, the recently revised DOD Directive 5000.1 does place increased emphasis on studies and analysis in support of Mission Element Need Statements (MENS) at the very early end of the acquisition cycle of new materiel.

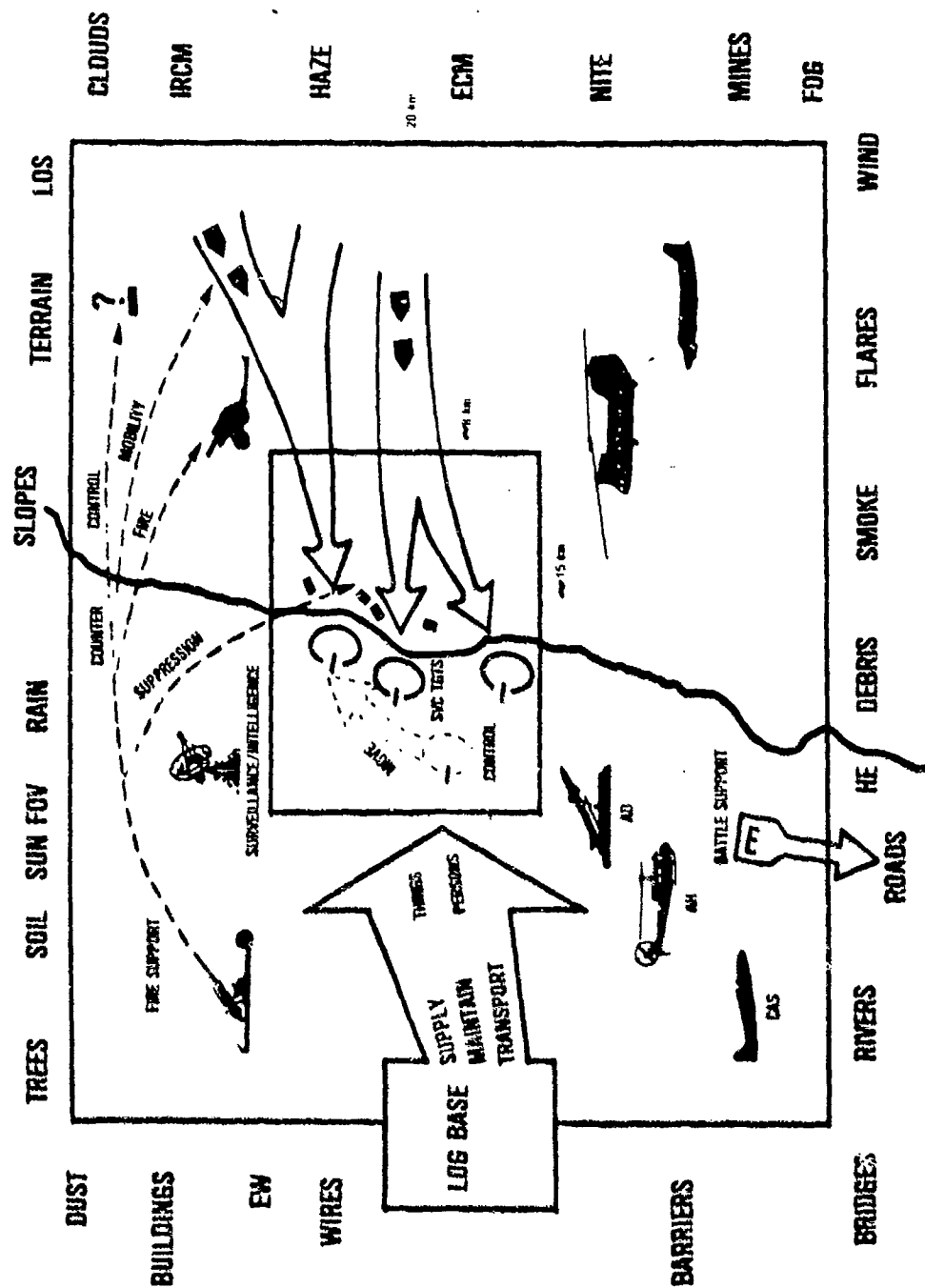


Figure 3-4. Factors Important in the Evaluation of Combined Arms Combat

b. An absence of comprehensive regulations notwithstanding, the analysis community has made considerable progress toward agreement on the types of analysis tools and techniques which are needed to help illuminate important issues. For example, there is now widespread agreement among senior Army analysis managers that the force level hierarchy of systems shown on Figure 3-5 constitutes a proper structure within which to classify Army systems operations and evaluations. The structure parallels the matrix organization construction of the actual Army in a theater of operations shown in Figure 3-3. It contains both the combat forces and the functional families of support systems. The major activities of force combat, movement, and reconstitution are identified. Item level systems are represented on Figure 3-5 as dots located at the lowest force level where that item system first appears in the hierarchy. In a few cases, item systems are grouped together in subordinate units as represented by the small boxes around items. A capability to evaluate this structure is clearly critical to the success which the analysis community will have in illuminating the many issues embedded within the structure.

Briefly, the evaluation process must:

- (1) Set the situation
 - (a) Create/reconstitute the force
 - (b) Position the forces
 - (c) Establish mission
- (2) Allocate and account for effects of combat support elements
 - (a) Surveillance/intelligence/fusion
 - (b) Control (includes command and communication)
 - (c) Fire support (including fixed wing aircraft)
 1. Counter control
 2. Counter mobility
 3. Counter fire
 4. Suppression
 5. Target servicing

[illegible]

NOTE: Dots nationally represent item level systems. The inclosure of one or more dots represents small units so equipped.

Figure 3-5. Basic Structural Concept--Operations and Evaluations

(d) Air defense (including Blue air)

(e) Battle support to include

1. Mines and obstacles
2. Smoke
3. EW
4. Bridges

(f) Personnel support to include

1. Medical
2. Morale
3. Administrative
4. Replacement

(g) Logistic support to include

1. Supply
2. Maintenance
3. Transportation

(3) Assess the combined arms battle

c. Historically, the analysis community has placed growing reliance on mathematical simulations for developing understanding of the complex interactions embedded in the structure of Figure 3-5 and for assisting in the evaluation process described above. Recent advances in simulation technology such as the discipline of top-down structured programming coupled with added experience of the analysis community in development of a wide variety of simulation tools have led to general agreement that a simulation hierarchy as shown in Figure 3-6 is both desirable and possible. The hierarchy consists of a basic stochastic simulation of combined arms combat at each of the three force levels of organization.

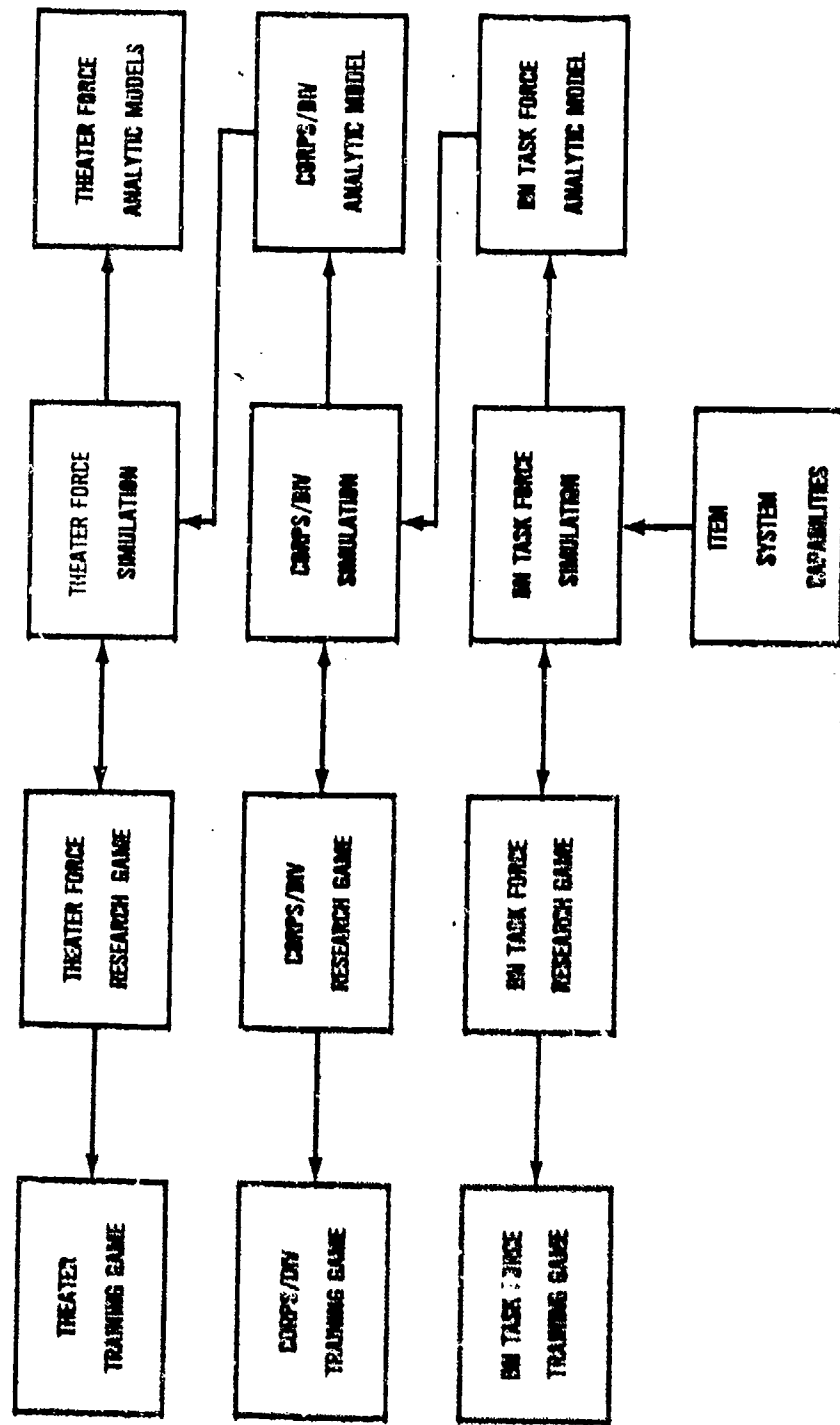


Figure 3-6. A Conceptual Structured Set of Simulations, Games, and Analytic Models

These single simulations would replace the large number of other simulations which at present are the subject of considerable criticism and compete for utilization on studies. Complementing each of the force level simulations would be a research oriented war game, probably computer assisted. These would be employed to gain that insight into the interactions of combat which can only be obtained by player participation. In addition, the research games in some ways provide a higher fidelity representation of the combat processes (in particular the control function) and can be used to provide feedback information to the design and operation of the stochastic simulation. It may even be feasible to mechanize the research game as a separate operating mode of the basic simulation through the attachment of graphics devices and employment of interactive techniques.

d. At each level of force organization, it appears desirable to also develop a war game for training purposes as shown on Figure 3-6. Such games currently exist at the battalion task force and division/corps level but would clearly benefit from the consistency which would result from close association with the combat simulation and research game. It now appears feasible that the research game and the training game at a particular level of force organization could be, in fact, two different operating modes of the same game (or simulation).

e. A mandatory characteristic of the set of simulations shown in Figure 3-6 is that there be consistency of combat representation up through the hierarchy. To accomplish this, each simulation should be capable of accepting input data relative to the performance of the smaller combat organizations or elements which comprise the force represented in the simulation. In other words, the theater force simulation must be constructed so as to accept and employ performance information about the combat divisions comprising it which is traceable to the outputs of corps/division simulation. The analysis community has experience and success in creating tools with this property. The methodology involves the development of an analytical model at each level of combat organization which is the companion to the combined arms combat simulation at that same level. These analytical models are shown on the right side of Figure 3-6. A mandatory property of each companion pair at each level is that when the simulation and the analytical model are each employed to evaluate the same combat scenario, they produce similar results. This can be achieved by aggregating the results of many simulation trials using the force simulation into analytical functions or equations which constitute the heart of the analytical model. The analytical model is characteristically much faster running and capable of generating force performance data over a wide range of conditions more quickly than its

companion simulation. It achieves this at the expense of reduced detail or fidelity. The analytical model constitutes the link between one level of combat force simulation and the next higher level.

f. A carefully constructed and configurationally controlled hierarchy of combined arms combat simulations is not in itself sufficient to assure consistency of analysis. The analysis organizations which make up the Army community must cooperate and interrelate extensively if the concept is to work successfully. Figure 3-7 illustrates this concept. On the left are represented the Army combat organizational levels or systems and on the right is the corresponding hierarchy of models. Whatever the analysis organizational structure, the information flow shown in the center of Figure 3-7 is essential. Basically, system characteristics and performance information is provided about the combat force or element for which an analysis organization is responsible to the organization responsible for analysis of the next higher level combat force. These data would be responsive to guidance issued from the user of this information to the providing organization in order to assure that the data being provided are pertinent to the combat objectives of interest and have been generated in the scenario settings of interest.

g. To an extent, the analysis organizations of the Army already fit the conceptual structure of Figure 3-7. Analyses involving issues at the theater force level are handled by the Concepts Analysis Agency (CAA); division/corps level analyses are the responsibility of TRADOC's Combined Arms Combat Developments Activity (CACDA) at Ft. Leavenworth. Battalion task force level analyses are handled by the TRADOC service schools with primary analysis support from the TRADOC Systems Analysis Activity (TRA-SANA) at White Sands Missile Range. At the item system level of analysis, the analysis workload is more distributed with the TRADOC schools and the DARCOM commodity commands and project managers all employing analysis activities in support of their respective missions and functions. In DARCOM, the most active single organization in this arena is the Army Materiel Systems Analysis Activity (AMSAA) at Aberdeen. Table 3-2 illustrates the relationships that would exist (and in some cases now exist) between these analysis organizations under the concept of Figure 3-7.

Table 3-2. Key Analysis Organizations

Level	Analysis organization(s)	Down flow from	Up flow from
Force	CAA	HQDA	CACDA
Corps/div	CACDAw/Log Cen & Admin Cen	CAA	Schools/TRASANA
Functional	Schools/TRASANA	CACDA	AMSAA
Bn task force	Schools/TRASANA	CACDA	AMSAA
Item	AMSAA	Schools/TRASANA	DARCOM Commodity Commands

h. To complete the concept of a hierarchically structured system of Army models, the vertically organized combat support functional areas should also be included. Figure 3-8 illustrates the minimum set of functional simulations, one in each of the combat support operations areas corresponding to Figure 3-5. The functional simulations would be employed to study issues of: allocation or balance of resources within the functional system; gaps or weaknesses within the function which might lead to requirements for new materiel; and tactics of employment and systems of control within the functional area. In general, the functional analysis efforts and, therefore, proponentcy for the simulation tools would reside with specific TRADOC service schools and/or integrating centers which currently have responsibility for these kinds of studies. On Figure 3-8, each simulation or model has been assigned a somewhat arbitrary acronym which derives from the generic name given to the function on Figure 3-5. The combined arms combat models shown on the left side of Figure 3-8 likewise have been assigned acronyms derived from the force level of organization which they represent.

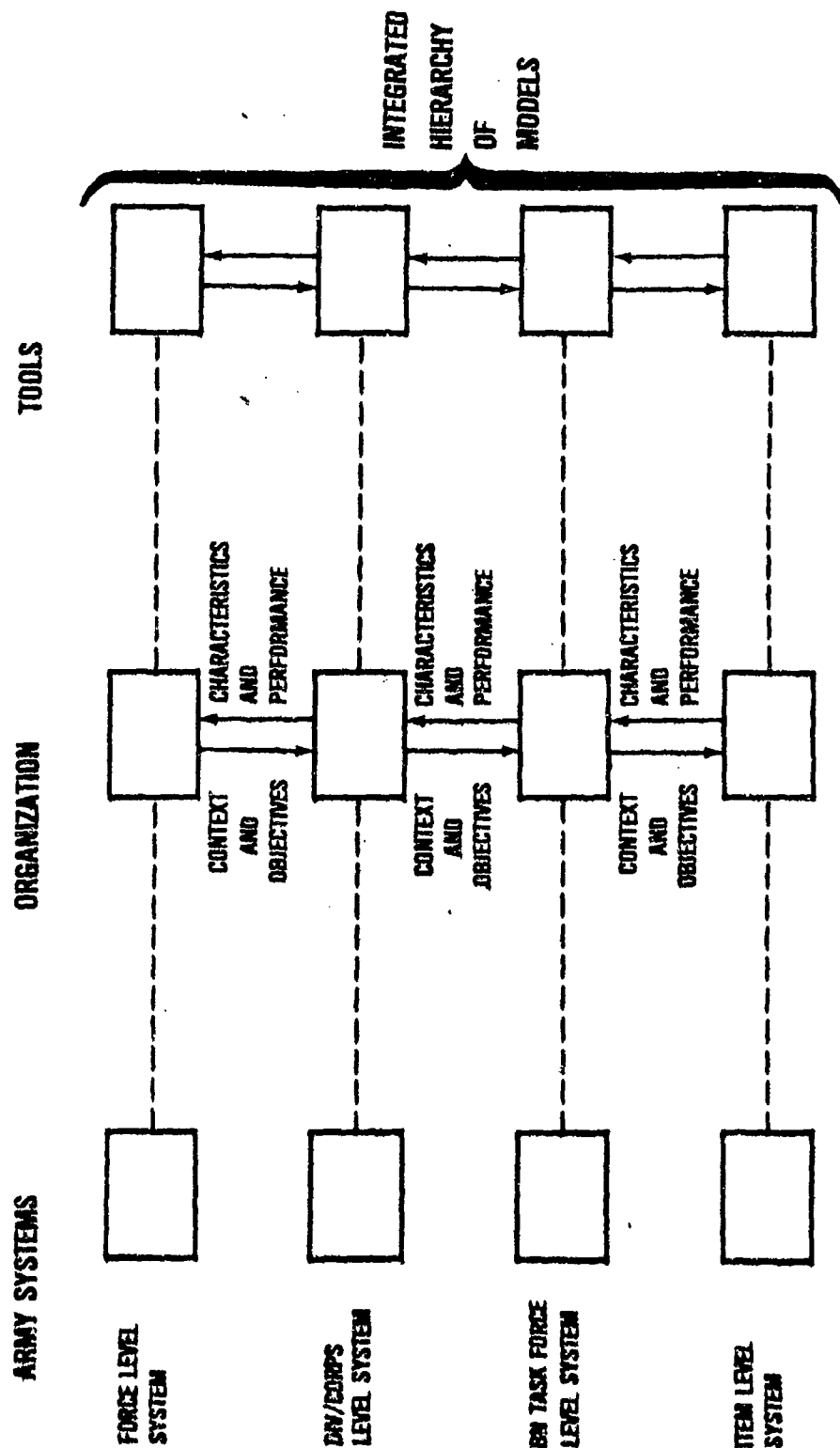


Figure 3-7. A Hierarchical Organization of Army Analysis and Tools can Effectively Integrate Army Analysis

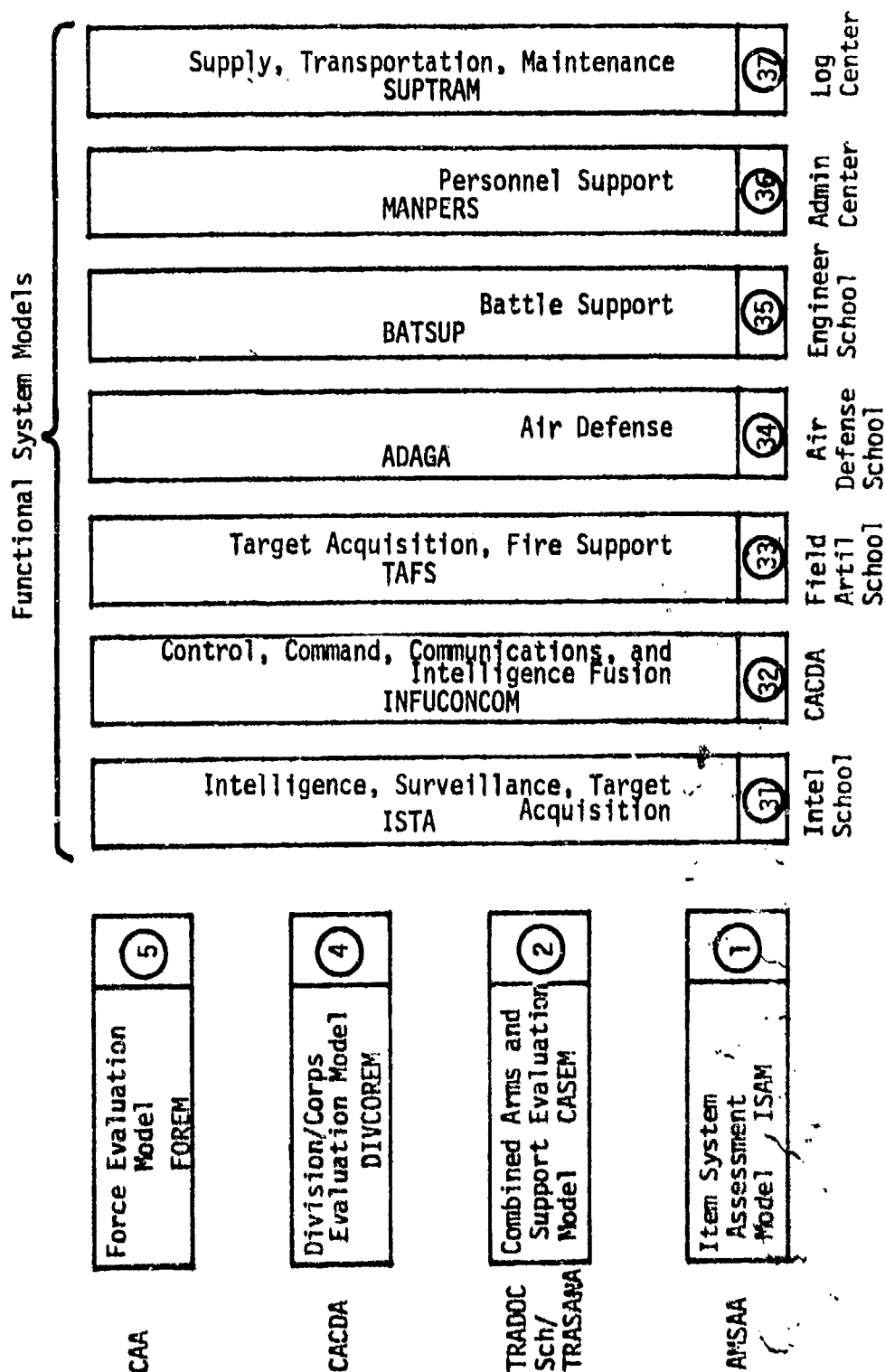


Figure 3-8. A System of Army Models (Numbers are keyed to levels of hierarchy of Army systems)

CHAPTER 4

PERCEIVED STRENGTHS AND WEAKNESSES OF THE ARMY STUDIES AND ANALYSIS COMMUNITY AND ITS PRODUCTS

4-1. PURPOSE. This chapter discusses the perceptions collected during conduct of the study concerning strengths and weaknesses of Army studies and analysis.

4-2. SOURCE OF DATA. Early in the study, a collection effort was conducted to ascertain and record the perceptions of a variety of knowledgeable personnel regarding the strengths and weaknesses of the Army analytical community. The study team believed that the perceptions of experienced people could be used to identify areas for further investigation. Personal interviews, formal questionnaires, and group sensing sessions were employed to acquire the perceptions.

4.3. PERCEPTIONS. Appendix C is a detailed discussion of the perceptions obtained. In the paragraphs that follow, the perceived strengths and weaknesses are listed. Because the thrust of the study was to seek ways to improve the community, a considerably larger number of perceived weaknesses vis-a-vis strengths are identified.

a. Perceived Strengths. Strengths identified could be categorized in three broad categories:

(1) Perceived Institutional Strengths

- (a) Continuity of commitment including resources.
- (b) Size/maturity of in-house study organizations.
- (c) Decentralization of initiatives.
- (d) Balance of user/developer interest.
- (e) Growing capability to anticipate, not just react.

(2) Perceived Personnel Strengths

- (a) Integrity
- (b) Enthusiasm
- (c) High quality of military OR analysts.
- (d) Sheer capacity and willingness to work.

(e) Willingness to tackle tough problems.

(3) Perceived Community Strengths

(a) Availability of data bases.

(b) Spirit of openness.

(c) "Character" of institutions.

(d) Communications within the community.

(e) Access to experimentation.

(f) Versatility--width of experiences.

(g) Inventory of evaluation models.

(h) Respect for counter-example.

b. Perceived Weaknesses. Perceived weaknesses in the studies and analysis community could be categorized as follows:

(1) Perceived Program Formulation/Presentation Weaknesses

(a) No way to know whether the right problems are being studied.

(b) Study program fragmented, not orchestrated.

(c) Study program has little central guidance.

(d) Study program poorly presented to Research and Development Advisory Committee (RDAC), Office of Secretary of Defense (OSD), Congress.

(2) Perceived Management Weaknesses

(a) Army corporate level needs direct access to first-rate think house.

(b) ARI mal-attached to DCSPER.

(c) Contractual process prohibitive.

(d) Interfaces between study agencies ill-established.

(3) Perceived Lack of Emphasis on and Lack of Capabilities for:

- (a) Requirements analysis.
- (b) Logistic sustainability studies.
- (c) Maintenance concepts.
- (d) Personnel studies.
- (e) Implications of women in the Army.
- (f) Cost or benefits of Enhancement of Life in Europe (ELIFE) program.
- (g) True cost of civilian manpower.
- (h) Effects of variation in compensation.
- (i) Training research--cost or effectiveness of training alternatives.
- (j) Implications of changing rotation base.
- (k) Base structure implications.
- (l) Force planning.

(4) Perceived Analysis Methodology Weaknesses

- (a) Takes too long--reports too thick.
- (b) Uses overly complex--opaque--tools.
- (c) Tries to simulate too much.
- (d) Too little use of history and field test results.
- (e) Modelers work beyond competency.
- (f) Model anarchy.
- (g) Oversearch for materiel solutions.
- (h) Use of scores such as weapons effectiveness indicators/weighted unit values (WEI/WUV) mislead.
- (i) Biases - Countermeasures not analyzed enough
 - Too high estimate of dollars

- Cost too low; time too short

(j) Fixation on Fulda area in scenarios.

(k) Inadequate sensitivity.

(5) Perceived Staffing Weaknesses

(a) Civilian staffs at certain agencies not first rate.

(b) Analyst quality program weak.

(c) Aging of analysts.

(6) Perceived Study Product Quality Control Weaknesses

(a) In-house work below better contractor work.

(b) Inconsistent assumptions--study to study.

(c) Threat tailoring.

(d) Suppressed alternatives.

(e) Overly driven by doctrinaire military assumptions.

(f) Fails to show out-year affordability problems.

(g) Lack of objectivity in staff studies.

(h) Lack of "peer review."

(i) Lack of standards for study product quality.

(7) Other Perceived Weaknesses

(a) Analysis capability at TRADOC schools and centers below needs.

(b) Division-level tradeoffs among branch systems weak-to-negligible.

(d) Force level analysis too narrow and not adequately inclusive.

(e) Too little use of contractors vice in-house.

(f) Vulnerability data--late and incomplete.

4-4. DISCUSSION. It is reemphasized that the above list is of perceptions. The review did not find every one to be justified by the facts. Each of the perceptions is treated in the appropriate parts of the report.

CHAPTER 5

THE ARMY STUDY PROGRAM AND STUDY SYSTEM

5-1. INTRODUCTION. Data regarding work being done in the Army study program is contained in Appendix D. The Army Study System (TASS), as it currently operates, is described at Appendix E. That appendix also examines the shortcomings of the current system and three alternative systems. One of the alternatives, a highly centralized system, was developed by the Engineer Study Center (ESC) in a separate substudy which is at Appendix F. Appendix G contains a detailed discussion of the funding aspects of Army analysis and examines the pros and cons of various alternatives.

5-2. FINDINGS. a. Program Balance

(1) A commonly held perception is that the study program is unbalanced, that most effort goes into mid-term hardware studies and little into anything else. In investigating balance, the Study Group examined the FY 78 program from a variety of perspectives.

(a) Figure 5-1 displays the program according to the time period in which the work could first affect the operational capability of Army forces in the field. Contrary to perceptions, a significant amount of effort (30 percent) is devoted to work with near-term effect. But, in agreement with perceptions, a sizeable amount does go to mid-term studies and little to studies of the far-term. Further, the far-term oriented effort is largely related to technology. From this perspective, the program can possibly be considered to be out of balance, having too little effort committed to the far-term and possibly the near-term.

(b) Figure 5-2 displays the program according to the elements of a system. Several observations can be made of this display. First, the procedural and people aspects of systems get little effort in proportion to the hardware aspects. Second, of the effort on the hardware component, relatively little goes to finding out what hardware is needed. Third, very little effort goes to studying the environments in which systems are to be used. From this perspective, the program can be considered out of balance.

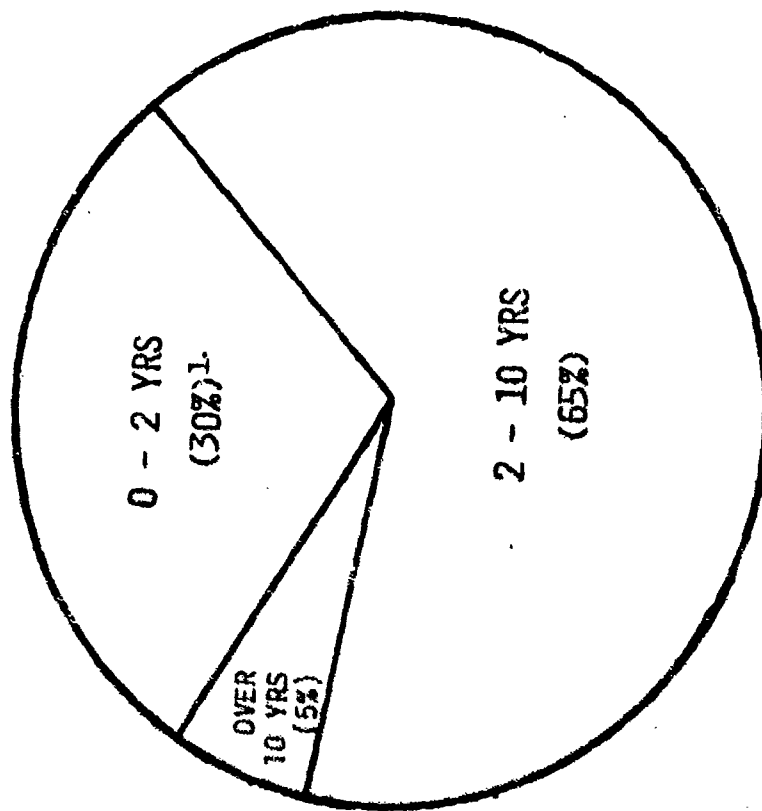


Figure 5-1. Period When Work Could First Affect Operational Capability of Army Forces in the Field

This value probably overstates the actual percentage by as much as 10 percent. There are indications that the survey question was misinterpreted by some reporting agencies. A breakout of the data by source agency is provided in Appendix D, page D-I-7.

TRAINING	-----	10%
PERSONNEL	-----	4%
TACTIC/DOCT	-----	3%
THINGS	-----	50%
WHETHER CLASS	-----	1%
KIND REQUIRED	-----	8%
PERF OF	-----	18%
EFFECT OF	-----	23%
ENVIRONMENTS OF USE	-----	2%
THREAT	-----	1%
COSTS	-----	3%*
OTHER	-----	27%

* DOES NOT INCL "COST ANALYSIS"

Figure 5-2. Distribution of Work Elements of Systems

(c) Figure 5-3 displays the program according to level of system. This shows, consistent with the display of effort on system elements, the bulk of the effort going to subitem/item and functional level systems. Relatively little effort goes to small unit, large organizations, or force level systems. From this perspective the program can be considered out of balance.

(d) Another way of viewing balance is in terms of the effort that is focused on the Army's most important problems. The Chief of Staff/Secretary of the Army Priority Problem Areas (PPA) are developed to focus the overall program on certain areas, but very few studies are initiated in response to the PPA and few believe that the PPA have significantly influenced program content. Few believe that the program is truly focused on the Army's most important problems and thus, from this perspective, the program is out of balance.

(2) The first finding in this area is that from a variety of viewpoints, the overall analytical effort is not considered to be balanced and that the current distribution of effort is not meeting the true needs of the Army.

b. Guidance. The discussion, above, of lack of program balance indicates that the present system of providing guidance needs strengthening.

c. Control. The current system of providing guidance is divorced from allocation of resources and lacks any control mechanism to insure that guidance is followed. The current Study Management Office (SMO) in OCSA largely performs administrative functions, lacking the mission and ability to control and evaluate the study program.

d. Information. The current process of collecting information off-line from the program/budget process does not provide adequate information for the Army internally to manage or externally to mount an effective program defense.

(1) The current budget formulation process does not include the mechanisms necessary to generate total study and analysis resource requirements.

(2) The Department of Defense requirement to present a special analysis of proposed study programs as part of the budget justification has not been effectively implemented.

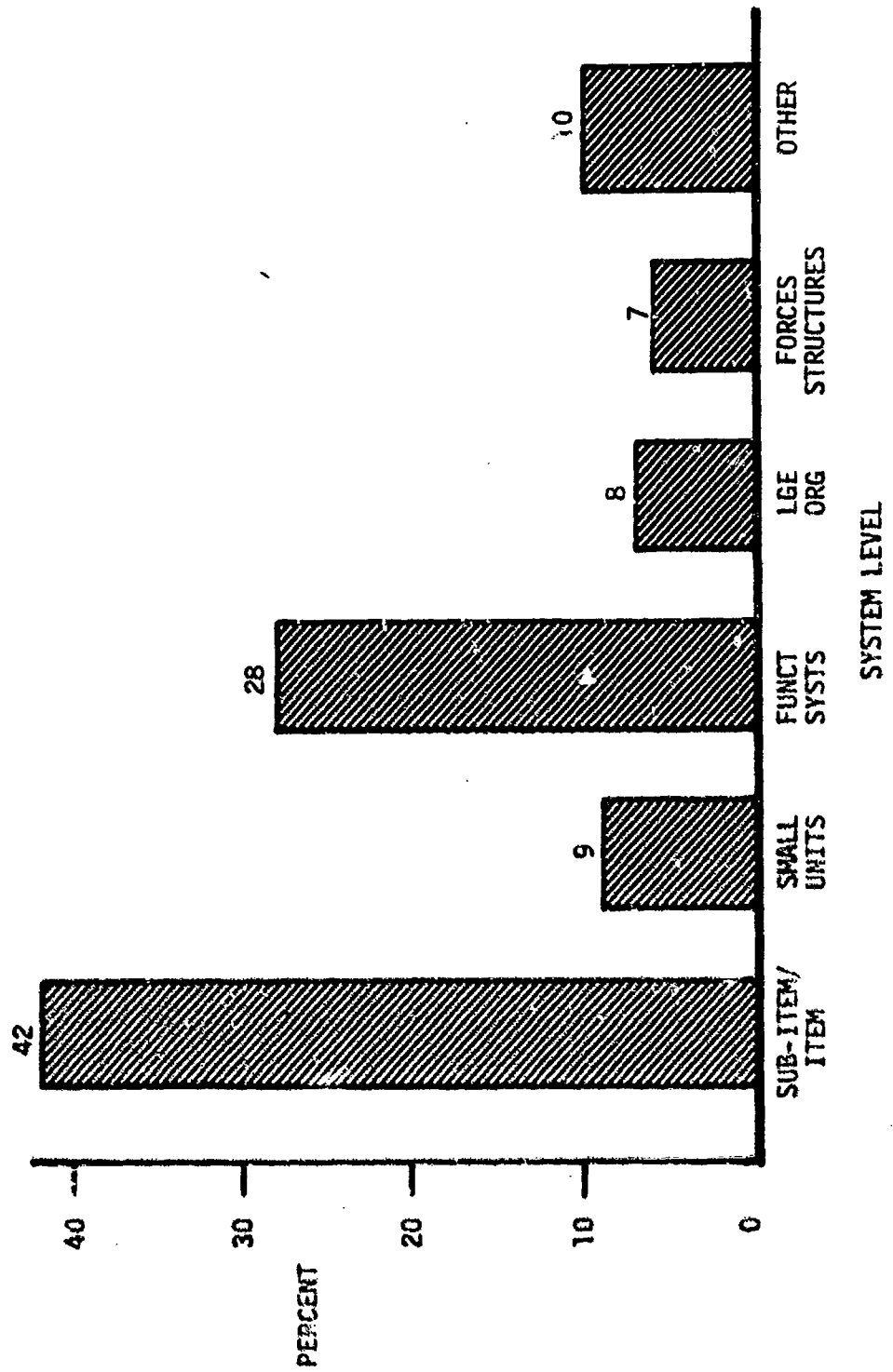


Figure 5-3. Distribution of Work by System Level

(3) The current definition of studies in AR 5-5 does not encompass all activities that are considered to be studies by OSD and Congress.

(4) Justification materials have often been inconsistent.

5-3. PROPOSED SOLUTIONS. a. Guidance

(1) Objective. The Army study program needs guidance that will balance the effort across all the many dimensions of the program while ensuring that effort is focused on the most important problems.

(2) Proposed Solution

(a) A Study Program Management Office (SMO) should be created in OCSA to maintain continuing analysis of program balance and content and provide this when soliciting guidance input. It should also develop draft guidance.

(b) The SMO would present proposed guidance to an Army Study Council consisting of VCSA, HQDA principals, CDR DARCOM, CDR TRADOC, and other MACOM representatives.

(c) Alternative approaches in guidance approval include SMO staffing and SMO presentation to SELCOM. The Study Group favors the Council approach because it involves HQDA principals in the guidance process and allows for high-level MACOM participation.

b. Program Control

(1) Objective. Control the study program to support the guidance.

(2) Proposed Solution

(a) Consider the analysis resources of the entire Army as a resource to be managed in support of the entire Army. This implies three levels of resource controls: HQDA, MACOM HQ, and subordinate element/agency. HQDA would control sufficient resources Army-wide to insure that the program addresses the PPA. MACOM HQ would directly control some segment of their resources in support of high priority MACOM objectives, and the remainder (the great bulk of the total analytical effort) would be reserved to subordinate elements/agencies in support of assigned mission accomplishment.

(b) Upon receipt of guidance, agencies and MACOMs would prepare programs responsive to the DA guidance and needs.

(c) HQDA would review programs for balance and responsiveness to guidance. Program approval would be by VCSA. SMO would act as secretariat to a Study Program Resource Allocation Committee (a DM chaired committee with staff and MACOM representation) which would review the program in detail, adjust as necessary, and forward to the Army Study Council for program approval by the VCSA.

(d) An alternative to the committee approach above would be for the SMO to review and staff the program and brief to SELCOM for VCSA approval. The Study Group favors the committee approach as providing a forum and mechanism for resource balancing by face-to-face discussions among the interested parties.

c. Organization

(1) Objective. Provide HQDA organization consistent with the desired level of study program control.

(2) Proposed Solution

(a) Three separate groups (the current OCSA Study Management Office, the Systems Research and Analysis Office of ODCSRDA, and the Engineer Studies Center) were asked to provide views on how to organize within HQDA to manage the Army study program. The solutions developed ranged from minimal changes to the present highly decentralized system to a very highly centralized system with a relatively large (18 professionals) office headed by a major general reporting to the Director of the Army Staff. The Study Group favors an intermediate solution because it provides for adequate guidance, control, and evaluation while retaining decentralized program formulation and execution.

(b) The mission and resources of the Study Management Office (SMO) should be expanded to become the Study Program Management Office (SPMO). The office chief should be elevated to super grade status reporting to the Director of Management. The number of professionals in the office should be increased from the current three to a minimum of six and possibly as many as ten. The exact number should be determined after some experience with the smaller number. The SPMO would act as the secretariat for the proposed Guidance Council and Program Allocation Committee, review programs proposed by study agencies, coordinate budget formulation and defense for all studies, and assist in implementing quality control measures.

d. Information

(1) Objective. Improve visibility of studies in PPBS.

(2) Proposed Solution

(a) Initiate Army action to improve justification and defense of the Army study and analysis portion of the budget. Adopt practices that respond to Congressional intent. Revise AR 5-5 to provide a broader definition of studies. Adopt an active budget defense posture. Prepare and submit funding information (Exhibit PB-21) on-line as part of the budget development process. Establish the Study Program Management Office as the manager of a functional studies and analysis program as provided for by CSR 11-5 and further embed the study program in other program elements.

(b) A detailed discussion of the proposed solution and a range of alternatives is presented in Appendix G.

5-4. PROPOSED ACTIONS. The following consolidated list of actions would implement all of the proposed solutions discussed above.

a. Establish an Army Study Council to review and approve study guidance and programs. Council should be chaired by VCSA and be composed of HQDA principals, TRADOC and DARCOM commanders, and representatives of other MACOMs.

b. Establish a Study Program Allocation Committee to review and balance programs and recommend to Army Study Council. The committee should be chaired by Director of Management (OCSA) with appropriate HQDA and MACOM representation.

c. Expand the mission and resources of the current Study Management Office (SMO) to form a Study Program Management Office (SPMO).

(1) Increase the office size to 6-10 professionals from the present three. The office should have a super grade chief reporting to the Director of Management.

(2) SPMO should execute all current SMO functions plus assist in development of guidance, serve as secretariat for Study Council and Program Allocation Committee, and serve as functional program manager.

d. Require the budget process to capture study data on-line. Eliminate program elements for HQDA and TRADOC studies and include these funds in budgets of operating agencies. Revise AR 5-5 to align definition of studies with OSD and Congressional requirements.

CHAPTER 6

STUDIES OF FORCES AND CERTAIN FORCE-WIDE ISSUES

6-1. INTRODUCTION. This chapter principally concerns weaknesses in the study of Army forces and improvements that can be made. It also addresses the particular perceived inadequacy of studies in the general area of manpower and personnel and addresses the general issue of providing adequate analysis capability in support of HQDA. Two substudies support these latter examinations: Appendix H examines contract support to Army analysis, and Appendix I examines the capability for performing manpower and personnel analyses.

6-2. FINDINGS. a. Linkage. The concept for Army analysis calls for linkages between the levels of the systems hierarchy. From the higher level should come goals, objectives, and context within which the next lower level should conduct its analyses. Those analyses should then provide upward the characteristics, performance, and capabilities of the systems at that level. The study group review of programs, meetings with agencies, and interviews with knowledgeable individuals, all indicated that these kinds of linkages did not exist; that while there were extensive inter-agency contacts and exchange of input data there were no linkages of the kind envisioned in the concept. This, in particular, applies in this chapter to the linkages between the Strategic Studies Institute and the Concepts Analysis Agency, and between the Concepts Analysis Agency and the TRADOC Combined Arms Combat Development Activity.

b. Comprehensiveness. From the same sources as above, it was found that force level studies do not address many of the alternatives and issues that should be of interest. Some particular areas of inadequacy are as follows.

(1) Limited analysis of alternative force structures, especially alternative configurations of the combat forces (hence the need for a special study to respond to OMB Issue Number 3 challenging the Army mix of heavy and light forces).

(2) No analysis of the balance of combat and support forces (the current family of force studies, including logistics studies, do not attempt to determine an optimum balance of combat forces and support).

(3) Little analysis of the personnel and manpower aspects of forces that are examined in force level studies and little analysis of manpower and personnel issues of Army-wide interest.

HQDA Access to Analysis Capability

(1) It is a commonly held perception in OSD and in some parts of the Army that HQDA does not have access to responsive analytical support of high quality. Further, that CAA is fully engaged in supporting the DCSOPS and that requests that go to MACO are not responded to in time to be useful.

(2) The perceptions are frequently offered in the form of a solution; namely, create an Army study and analysis FCRC. Other versions include using existing FCRCs or simply increasing the amount of studies done on contract. Another facet of this is the perceived in-/out-of-house imbalance. Data (Appendix H) support the imbalance thesis: that the Army does relatively little of its study and analysis program out-of-house (10 to 20 percent); that the out-of-house portion has trended steadily downward since the mid-/late-1960s; and that the in-/out-of-house balance is very different from the other services who conduct more than half of their programs out-of-house.

6-3. PROPOSED SOLUTIONS. a. Linkage

(1) Objective. Improve linkage between Strategic Studies Institute and force level studies done by the Concepts Analysis Agency. Likewise, improve the linkage between the CAA force level studies and studies of large combined arms organizations, e.g., division and corps by TRADOC/CACDA.

(2) Proposed Solution

(a) Define an integrated family of studies that describes the required strategic studies and force level studies. Define the interface between force level studies and combat developments studies of large organizations.

(b) At the Strategic Studies Institute (SSI), conduct strategic studies as defined above and, from the results, provide goals, objectives, and context to force level studies. Require that force level studies be conducted using the goals, objectives, and context produced by strategic studies.

(c) Conduct force level studies that produce goals, objectives, and context (scenarios) for studies of major organizations. Require that studies of major organizations be conducted in context of force level goals, objectives, and context.

(d) Develop appropriate parts of the integrated hierarchy of Army models as described in the concept and in Chapter 10.

b. Comprehensiveness

(1) Objective. Conduct comprehensive force level studies and studies of Army-wide interest.

(2) Proposed Solutions

(a) Define family of force level studies as specified above.

(b) Increase capability of CAA so that it can analyze the logistics, manpower, and personnel aspects of alternative forces and can conduct analyses of selected manpower and personnel issues of Army-wide interest. Increased capability should be in form of both in-house personnel and contract funds.

(c) Change the mission of the Army Research Institute (ARI) so that it clearly is called upon to conduct studies and analyses as well as pure research. ARI could do studies in which attitudes, behavior, social, psychological, and motivational aspects are paramount whereas CAA would do studies in which the numerical analysis tools would be very helpful.

(d) An alternative to the proposed approach would be to increase the capability to perform force logistics analysis at the Logistics Evaluation Agency and to create the capability to analyze force manpower and personnel issues solely at the Army Research Institute or perhaps the TRADOC Administration Center. The Study Group believes that this kind of dispersed approach would not result in the improvements that clearly are needed. Personnel matters must be studied as well as research, and logistics and personnel are such central aspects of forces that they must be analyzed in an integrated manner rather than analyzed apart from the analysis of structure and combat operation.

c. HQDA Access to Analysis

(1) Objective. Improve HQDA access to analysis.

(2) Proposed Solution

(a) Increase the capability of CAA to respond to the needs of all elements of HQDA by increasing resources in in-house personnel and contract funds. Change CAA mission to reflect this and have the Commander, CAA, report to the Director of the Army Staff. Assign each HQDA principal a portion of the CAA capability that can be tasked directly (a "line-of-credit").

(b) The Study Group investigated a variety of alternatives, particularly in the form of contractual arrangements, ranging from creating a new FCRC to improving the responsiveness of the current contract procedures. FCRCs and similar arrangements do not appear to offer advantages over in-house supported by contracts that would warrant the effort, especially in view of the highly uncertain likelihood of successfully establishing a new FCRC. The Study Group does find an imbalance between in- and out-of-house and believes that increasing contract resources as part of expanding CAA's capability as an analytical Field Operating Agency is a reasonable way of accomplishing this objective without the disruption other alternatives could entail.

(c) An alternative organizational arrangement would have CAA continue to report to the DCSOPS but with provision of the "line-of-credit" to HQDA principals. The Study Group does not favor this alternative because it feels that this could continue the current situation in which CAA works almost solely for DCSOPS.

6-4. PROPOSED ACTIONS. a. Define integrated family of strategic and force level studies and the interface with combat developments studies. Require that the studies be performed and the results provided in form suitable for use in a hierarchy of studies using a hierarchy of models.

b. Increase CAA capability to analyze all aspects of forces (e.g., operations, structure, logistics, manpower, personnel) and to support all elements of HQDA especially in conducting analysis of Army-wide manpower and personnel issues. Add personnel and contract resources to CAA. Assign Commander, CAA, to Director of Army Staff. Provide HQDA principals a "line-of-credit" to CAA capability.

CHAPTER 7

STUDIES OF COMBINED ARMS AND SUPPORT ORGANIZATIONS--BRIGADES, DIVISIONS, AND CORPS

7-1. INTRODUCTION. In the concept of Army analysis, the studies of combined arms and support organizations provide the goals, objectives, operational context, and model context for all other studies of functional systems, small units, and item level systems, and thus occupy a crucial position in the overall hierarchy. Because of this importance, the Study Group as a whole visited the Combined Arms Center at Ft. Leavenworth for a day's discussion of their capabilities and programs. Representatives of the TRADOC Logistics and Administration Centers also attended this meeting.

7-2. FINDINGS. a. Capabilities. The basic finding of the Study Group is that total analytical resources available to the Combined Arms Combat Development Activity (CACDA) of CAC are insufficient to support the very demanding mission of designing large combined arms and support organizations. This analysis capability resides principally in the Combat Operations Analysis Directorate (COAD) and the War Gaming and Scenario Directorate. COAD is a professional, competent analytical organization, but not adequate to the job it has.

b. Responsiveness. CACDA cannot responsively design and analyze brigades, divisions, and corps because of the insufficiency of capability and because of the inadequacy of the tools and techniques now available to the analysts. In particular, within this context, there is inadequate analysis of:

- (1) The control function.
- (2) Combat support and combat service support.
- (3) Battlefield environment.
- (4) Tradeoffs among the systems and units of the close combat forces and the functional systems.

c. Linkage. There is inadequate linkage between combat development studies of large organizations and HQDA sponsored studies of forces. This was discussed at some length in Chapter 6. Additionally, there appears to be inadequate linkage between combat development analyses and analysis in support of training developments, especially the training war games and simulations.

7-3. PROPOSED SOLUTIONS. a. Capabilities

(1) Objective. Provide analytical resources to CACDA adequate to its mission.

(2) Proposed Solution

(a) Create an analytical organization of 150 professionals (100 civilian, 50 military) with the nucleus (about 100 spaces) coming from existing CACDA analysis and gaming organizations.

(b) The Study Group considered three alternative organizational arrangements: expand the analysis group within CACDA; establish a TRASANA field office at Ft. Leavenworth under the operational control of CACDA, or; establish TRASANA field office at Ft. Leavenworth in direct support of CACDA but under the control of TRASANA (Figure 7-1). The Study Group favors the latter alternative as providing the kind of professional atmosphere for the sustaining high quality analytical organization needed.

b. Responsiveness

(1) Objective. Conduct analyses in support of the design and evaluation of large organizations responsive to the need to consider all the required functions and elements.

(2) Proposed Solution

(a) Develop methodologies and analytical tools suitable for analysis of alternative designs of brigades, divisions, and corps.

(b) Support the design, development, and operational use of the hierarchical system of Army models and associated data base system. This will be facilitated by supporting the current combined computer procurement which makes possible internetting of major analytical agency computer centers.

c. Linkage

(1) Objective. Improve linkages among force development, combat development, and training development.

(2) Proposed Solution

(a) Require development and use of major organization models be coordinated with Army hierarchy of models.

Expand CACDA	TRASAMA Field Office Under Operational Control of CACDA	TRASAMA Field Office in Direct Support of CACDA
<p>Improved career development for civilians</p> <p>Enlarged quality assurance base</p> <p>Achieve better mil/civ ratio at CACDA</p> <p>Better able to meet work load requirement</p> <p>Increased flexibility to respond</p> <p>Little improvement in intellectual climate (not influenced by TRASAMA)</p>	<p>Much improved career development</p> <p>Much enlarged quality assurance base</p> <p>Better mil/civ ratio, Leavenworth & TRASAMA</p> <p>Better able to meet work load requirement</p> <p>Increased flexibility to respond</p> <p>More improvement in intellectual climate (ties to TRASAMA)</p> <p>Better organization of resources</p> <p>More objectivity</p> <p>Closer modeling relationship with TRASAMA</p>	<p>Most improved career development (possible rotation between USMR and Leavenworth)</p> <p>Much enlarged quality assurance base</p> <p>Better mil/civ ratio, Leavenworth and TRASAMA</p> <p>Best able to meet work load requirement</p> <p>Most flexibility to respond</p> <p>Most improvement in intellectual climate (closer control by TRASAMA)</p> <p>Best organization/utilization of resources</p> <p>Most objectivity</p> <p>Less crisis management</p> <p>Best modeling relationship</p>
<p>Parochial interests</p> <p>No improvement in crisis management atmosphere</p> <p>Least intellectual climate improvement</p> <p>Least objectivity regarding methodologies and study planning</p>	<p>No improvement in crisis management</p> <p>Sub optimized to CACDA needs vice TRADOC</p> <p>Two masters syndrome possibility</p>	<p>Span of Control</p> <p>Possibly less responsive</p>

Advantages

Disadvantages

Figure 7-1. Advantages and Disadvantages of Alternatives for Increasing CACDA Analytical Support

(b) Establish actual interface of CACDA with TRADOC schools and centers and with TRASANA and CAA. Define flow up and down these levels of the hierarchy.

(c) Require integrated design and development of major units and lower level command group training simulations as part of the hierarchical system of Army models.

7-4. PROPOSED ACTIONS. a. Increase analytical spaces at CACDA to about 150 professionals. The Study Group recommends these be concentrated in a TRASANA field office in direct support to CACDA.

b. Initiate development of techniques suitable to analyze the design of alternative brigades, divisions, and corps.

c. Establish actual interface of CACDA with TRADOC centers and schools, TRASANA and CAA. This is essential to provide the linkages necessary to mission accomplishment of these agencies.

d. Require development and use of major organization models be coordinated with hierarchy of Army models. Require that command group training simulations be part of the hierarchy.

CHAPTER 8

STUDIES OF FUNCTIONAL SYSTEMS, UNITS, AND REQUIREMENTS FOR ITEM SYSTEMS

8-1. INTRODUCTION. The concept of Army analysis describes the system hierarchy of the Army as a matrix of levels of combined arms and support organizations intersected by functional systems that vertically cut across organizational boundaries. The responsibility for analyzing the functional system, including small units and requirements for item level systems, rests largely with the TRADOC schools and centers supported by TRASANA. This responsibility was recently reinforced by the reaffirmation of the current system for conducting cost and operational effectiveness analyses.

8-2. FINDINGS. a. Quantity and Quality

(1) The Study Group finds analysis of functional systems, units, and requirements for item systems to be highly variable in both quantity and quality.

(2) Regarding quantity, Table 8-1 shows the FY 78 program displayed by the capability categories used in Army PPBS. There is a large, obvious program imbalance in the very small amount of effort devoted to analysis of the control function.

Table 8-1. Distribution of Work by Capability Category

	Percent
Intelligence, surveillance, target acquisition	4
Control	1
Close combat	11
Fire support	8
Air defense	4
Other combat support	6
Logistics	9
Other combat service support	6
Research	5
Program-wide support	41
Other	5

(3) Because the TRADOC schools and centers bear the bulk of the analytical responsibility for functional systems, it is important that they be properly staffed. The Study Group finds that this is not the case. These institutions rely primarily on military specialty 49 officers for capability, but of all the authorized SC 49 positions associated with analysis in the schools and centers, only 52 percent are currently filled despite an overall Army fill rate of 74 percent. Of the 52 percent filled, it is probable that some are not qualified, further degrading the on-hand capability. Appendix J presents a detailed discussion of the ORSA specialty situation.

b. Requirements Analysis. There is a weak analytical base for many of the Army's requirements for item level systems. This fact leads to repeated challenges to the requirement by OSD, OMB, Congress, and others, with the result that cost and operational effectiveness analyses (COEA) at milestones late in the program end up being directed to justification of the program rather than a comparison of the merits of alternative ways of satisfying the requirement. This detracts from the overall analytical efforts of the Army.

c. Training Effectiveness. The Army conducts few studies (and indeed cannot conduct many for lack of basic data) of the effectiveness of different means of training. It is possible, though, that this is an area of potentially great payoff for a modest investment.

d. Distribution of Effort. The Army gives disproportionate emphasis to analysis of small unit ground combat and to item level systems comprising small combined arms units. The data shown at Table 8-1 and earlier at Figure 5-2 substantiate this.

8-3. PROPOSED SOLUTIONS. a. Quantity and Quality

(1) Objective. Improve the quantity and quality of analysis of functional systems, especially the intelligence/fusion and control functions.

(2) Proposed Solution

(a) Increase analysis resources at TRADOC schools and centers by assigning qualified SC 49 officers to the authorized positions. Implicit in this solution is that SC 49 officers would, contrary to current practice, not be assigned so freely to positions not in their primary or alternate specialty. Modification of the DAMPL is justified if it is necessary to provide a

more equitable distribution of trained analysts to the organizations responsible for doing analysis.

(b) Conduct a continuing program of functional studies in each functional area.

(c) Develop improved analytical tools in coordination with the hierarchy of Army models.

b. Requirements Analysis

(1) Objective. Conduct analyses to better support item system requirements (especially in early, MENS \Rightarrow ROC, program phases).

(2) Proposed Solution. Same as 8-3a(2)(b) above. Use the continuing program of functional studies as Mission Area Analyses for early need justification and later justification that the kind of system is required.

c. Training Effectiveness Analysis/Balance

(1) Objective. Provide analytical support to Army training programs.

(2) Proposed Solution

(a) Increase training analysis resources at TRASANA and possibly the TRADOC schools and centers. The action identified earlier to increase the SC 49 officer fill will serve here as well.

(b) Increase analytical effort available to study training effectiveness. Decrease effort on COEAs.

(c) Improve techniques for analyzing training effectiveness and expand efforts to collect the required basic data.

8-4. PROPOSED ACTIONS. a. Fill the SC 49 authorized positions in TRADOC schools and centers with qualified SC 49 officers. Plans should be developed for improving the quantity, quality, and utilization of SC 49 officers.

b. Place more emphasis on analysis of the control functional area.

c. Establish a continuing study program in each functional area to underpin item level system requirements.

d. Increase the portion of TRADOC analysis resources that are applied to analyses of training. Reduce effort on COEA.

e. Require development and use of models of functional systems to be coordinated with Army hierarchy of models.

CHAPTER 9

STUDIES OF ITEM LEVEL SYSTEMS

9-1. INTRODUCTION. a. This chapter discusses the main findings and suggested improvements in analysis of item systems such as tanks, howitzers, and helicopters.

b. The work on item level systems is done mainly by four kinds of Army organizations:

(1) The TRADOC schools (and in some cases, integrating centers) which determine whether each item class is required as well as the characteristics and performance to be required of new developments.

(2) TRASANA, which provides analytical support to the TRADOC proponent schools, especially in the conduct of COEAs to determine which alternative item system best meets the needs of the Army.

(3) AMSAA, which produces most of the estimates of the item system performance.

(4) DARCOM R&D Command analysis elements and project managers, which provide system characteristics.

9-2. FINDINGS. a. Conditions of Usage

(1) The review of the ongoing Army studies and analyses show that a large portion--approximately half--of all the work is done in connection with item level systems. However, not enough work is done on three important aspects: analysis of whether the class of systems is required, analysis of the optimum characteristics to be specified for an item system, and analysis of the spectrum of environments in which item systems would be used in combat.

(2) The analysis shortfalls listed above occur mainly at the TRADOC schools. Improvements in these areas are needed. The solutions offered in Chapter 8 would help with the first two shortfalls; the third shortfall is discussed below.

(3) The tendency of TRADOC to not analyze adequately and specify a full range of environments of use of item systems is paralleled by a DARCOM tendency to not examine the performance of items over the full set of conditions of use. The recent initiatives to acquire information regarding the capabilities and limitations of item systems using optics in the "dirty battlefield"

environment illustrate the need to emphasize that systems should be evaluated in the real environments of use. ECM, weather, terrain, and threat environments are no less important than system characteristics in any determination of system effectiveness.

b. Analysis of C³I Systems. The whole group of C³I item systems seems to have received relatively too little attention in the past. One result has been that the Army analysis community is not now in a strong position to provide professional advice regarding the merits of alternative system approaches. Increasingly, these C³I item systems are critical to the performance of the control and intelligence functions of land combat, and, indeed, to the success of combat support and combat service support operations. Moreover, C³I system costs are growing, and vulnerabilities are relatively poorly understood.

c. Vulnerability Data. There remains a serious problem regarding the timely availability of reasonably complete data regarding the vulnerability of US and foreign systems. Responsibility for provision of this data now rests with the Vulnerability Division of the Ballistics Research Laboratory (BRL) of the Armament Research and Development Command of DARCOM. The problems regarding vulnerability data are not new, but they remain serious. Some have suggested that DARCOM should review the organization and staffing of the Vulnerability Division of BRL. The review group stopped short of suggesting this, mainly because it was aware that DARCOM has made changes within the past year and has still other changes underway--actions which even if ultimately to be successful could not yet have been seen to eliminate the problems which is reported by others to remain:

d. Manpower/Personnel Ramifications. One final point is made regarding analysis of item systems. The introduction into the Army of new weapon systems and equipment usually places demands on the manpower/personnel system for numbers and kinds of personnel that are not precisely off-set by the numbers and kinds of people manning the system being replaced. Information concerning the manpower/personnel impact of new item systems is essential for planning and programing in this area and for total affordability studies.

9-3. PROPOSED SOLUTIONS. a. Conditions of Usage

(1) Objective. Conditions of usage must be fully characterized. Performance of systems must be determined for all conditions of usage.

(2) Proposed Solution

(a) TRADOC should undertake to better describe and define the full set of conditions of item systems. Future ROCs should give special emphasis to matters such as threats, weather, terrain, atmosphere, ECM/IRCM, etc.--the full set of environments needed to characterize the conditions of use. Future updates of DCPs made at decision milestones as part of the system acquisition process should emphasize the battlefield environments of use for systems already being developed.

(b) DARCOM, especially AMSAA, should make a serious effort to fill its data gaps regarding the performance of item systems in the real conditions of use. Some criticism that systems are being tested and evaluated in conditions not originally specified in the "requirements" can be expected. It should be acknowledged and the work to learn how systems actually will perform should continue.

b. Analysis of C³I Systems

(1) Objective. Improve analysis of C³I systems.

(2) Proposed Solution. DARCOM, especially AMSAA, should improve its capability to assess C³I systems.

c. Vulnerability Data

(1) Objective. Analytical activities should have timely access to complete vulnerability data.

(2) Proposed Solution. The adequacy of ongoing actions to improve the vulnerability data should be watched closely by DARCOM. If the problems are solved, then no further actions are required. On the other hand, it may be necessary to go beyond the actions now underway. In any case, it is clear that the problems which are seen now must be solved by ongoing, or future, changes in the way vulnerability data are provided.

d. Manpower/Personnel Ramifications

(1) Objective. Project, in the detail appropriate to the acquisition phase, information upon which to base determination of MOS, grade, and numbers of personnel required to operate, maintain, and support proposed item systems.

(2) Proposed Solution. DARCOM, especially AMSAA and HEL, should improve the capability to analyze item systems for manpower/personnel impact.

9-4. PROPOSED ACTIONS. a. TRADOC should describe and define a full set of conditions of usage, incorporating them into requirements documents. HQDA should incorporate into DCPs as they are updated.

b. DARCOM should develop data regarding the performance of systems under the real conditions of usage.

c. DARCOM, especially AMSAA, should develop capability to analyze C³I systems.

d. DARCOM should monitor efficiency of ongoing efforts to remedy problems in developing vulnerability data and take appropriate action.

e. DARCOM should develop data regarding the manpower/personnel ramifications of item systems.

CHAPTER 10

MODELS, DATA, AND DATA BASES

10-1. INTRODUCTION. Combined arms models are among the primary analysis tools. The analysis community needs large amounts of valid empirical data to use in these models. Imposing discipline and structure on the combat models would follow through to the data bases upon which they operate, and finally to the definition of empirical data requirements. These matters are discussed in detail in Appendix K.

10-2. FINDINGS. a. Models

(1) Combined Arms Combat Models

(a) The combined arms combat models are designed to address the effectiveness that would be achieved by forces or weapons mixes. The central position occupied by these models is attested to by the fact that Army analysis agencies such as AMSAA, TRASANA, CACDA, and CAA all make use of them. These four agencies each have simulations and war games addressing battalion through division level combat. Also, each of these agencies has at least one new simulation in some stage of development.

(b) The models in current use represent over 25 years of acquisition, accumulation, improvement, and modification carried on to meet the analytic needs of specific study organizations. Every model requires a data base which generally is different from that of other models. Much of the input data is essentially unverified either against other models or against empirical data. There is a lack of information flow among models run by different agencies. Each agency has established an inventory of models with which to address study taskings. CAA, which should be dealing with questions pertaining to echelons above corps, uses models reaching down to the item level. AMSAA, whose work deals primarily at the item level, uses models which reach up to the division level of combat.

(2) Command Group Training Models. The Army has recently developed models and simulations for command group training. These began as state-of-the-art board games but have been further developed as minicomputer and mainframe-assisted war games. These games and models are designed as training devices which portray battlefield actions which place requirements on commanders and staffs. They are designed to be practical drills that require the application of combat, combat support, and combat service support

procedures and doctrine to solve tactical situations. A fundamental requirement of all games and models used for training is that they give students a realistic appreciation of both Red and Blue force capabilities under a variety of tactical situations. To this end, TRASANA has been charged with verifying the underlying methodology and data used in training models developed by TRADOC. However, to date, model developments by the training developers have not been directly coupled with those of the combat developers.

b. Data

(1) Quantitative Requirements. A review of the data requirements of the analysis community reveals a sizeable need which will not likely be satisfied in the very near future. The current data situation is being driven by three factors:

(a) First Factor--"Kerwin Sends". The response to the "Kerwin Sends" message entitled, "the use of realistic battlefield environmental conditions throughout the Army," has revealed a large gap in the availability of performance data on many Army systems.

(b) Second Factor--Old Systems and More Sophisticated New Systems. New systems under development frequently have performance characteristics which are very different from those of their predecessors. In some cases, system capabilities demand performance estimates in areas not previously quantified. Both developmental systems and fielded systems require that performance data be developed for realistic battlefield environmental conditions.

(c) Third Factor--More Sophisticated Models. The development of models which address large Army force organizations has continued. These models require data to address objectively and quantitatively, matters such as C³I, which in earlier years were treated more subjectively and qualitatively.

(2) Data Generation

(a) Much of the data used today was empirically derived that is, it was not developed either from historical data or generated by experiment. Most analysis agencies have no strong program for generating data from military history, after action combat reports, past field experiments and test data. In this regard, the record of Army analysis organization is not good and needs improvements.

(b) Test and experimental facilities are scarce in relation to the overall demand for services. These resources must, of course, provide the developmental testing/operational testing (DT/OT) required to support the materiel acquisition process. Other testing resources are absorbed by the force development test and experimentation program (FDTE).

c. Data Bases. The current data base situation is similar to the current model situation. The large number of models, each driven by its own data base, is a source of turbulence and inconsistencies. Two of the principal data suppliers, AMSAA/BRL, are repeatedly tasked to respond to quick reaction requests and demands for lethality, vulnerability, accuracy, and system characteristics data on old, new, Red and Blue weapon systems. Many requests are for basically the same type of information but with a different format and definition to fit a particular model's requirement.

10-3. PROPOSED SOLUTIONS. a. Models

(1) Objective. Insure consistency and efficiency of Army models.

(2) Proposed Solution

(a) A Structure for Analysis. The major analytic tools for analysis of Army systems and functional areas should parallel the hierarchical structure of Army systems and forces as described in the concept for Army analysis. These tools include the combined arms and support models. These models should be hierarchical in nature and exhibit the same interdependence as exists among the various echelons of real Army systems. They should also be compatible in the same way that real Army elements are compatible.

(b) Design. The design of a system of models whose constituent models are hierarchical, interdependent, and compatible in nature can best be accomplished through a well-coordinated, broad based effort on the part of the analysis community, especially by AMSAA, TRASANA, CACDA, and CAA. Maximum advantage should be taken of advances in data processing equipment, software design, and programing languages.

(c) Operations. The conceptual set of structured simulations, games, and analytic models should include interactive research games. The complex doctrine, tactics, and equipment characteristics of modern warfare appears to require the use of such an interactive game to explore relationships of combat and tactical processes so that the faster running, stand-alone, event

sequenced, stochastic computer simulations can be understood and programed. The research game also provides a natural base for the interactive training game at each echelon. Small and fast running analytic models can provide the primary interface between the stochastic combat models. The research games would be operated at the agencies responsible for their development and maintenance, i.e., battalion task force--TRASANA; division/corps--CACDA; and theater--CAA. The computer simulation and analytic models would be operated by those agencies having analysis requirements calling for their use.

(d) Management. The management of the hierarchical system of Army models should be centrally controlled. Each analysis organization should be responsible for managing its analytic tools, but there should be coordination of the entire system by a central oversight group. Complete documentation should be required to represent the model capabilities to all users. Programs of model verification should exist. Each model would be assigned to a model resource group of AMSAA, TRASANA, CACDA, or CAA, for development, configuration management, and maintenance. In addition, each model resource group would be responsible for identifying and generating requirements for empirical data and experimentation required to fill data voids and to verify existing data.

b. Data

(1) Objective. Develop required model data.

(2) Proposed Solution

(a) Realistic Battlefield Environments. TRADOC schools and centers must define performance needs and the type of environments in which the Army systems must operate. These environments could then be translated into system requirements and used in systems assessments. The environments which must be defined are those created by nature and by man.

(b) Old and New Systems. Defining the operating environments, and requiring that item systems be capable of performing in them should insure that the resources of the materiel developer are focused. TRADOC must provide the tactical scenarios which define the tactical context in which systems must operate. DARCOM must address the environments that are defined in order to translate them into subsystem design specifications. Good requirements statements will encourage DARCOM to establish programs to obtain required data. Establishing a disciplined set of combined arms models would simplify the definition of data to be generated and would insure a greater utility of the data obtained. Since fewer

models would be involved, the amount of duplication of effort to provide the data required would be reduced.

c. Data Bases

(1) Objective. Insure use of consistent, accurate data in Army analyses.

(2) Proposed Solution. The proposed solution would be to work towards an Army-wide analysis and training developments data base system. The purpose of the data base system would be to provide centralized management, access, and review of data required for an hierarchical system of Army models. The data base system would be a distributed, but centrally managed, system. Central management could be carried out by a Data Base Management Group consisting of inter alia representatives of TRASANA, CAA CACDA, and AMSAA. The Data Base Management Group would be responsible for structure, coordination, and security as well as providing access and updating procedures, developing data guides and data element listings, and establishing interfaces with other data base systems and libraries. The data base system would be service oriented. As such, it would provide data and services as specified and required by the Army analysis community. In general, the services to be provided by each data base office would be system access for automated data, a verified response for hard copy information, data searches, provision of SOPs and data guides, access to other data base systems libraries, etc. The envisaged data base system would be responsive to the hierarchical model resource groups and report to an Army Model Committee, and it could constitute a data base resource group of that committee.

10-4. PROPOSED ACTIONS. a. TRADOC should continue efforts to produce statements of requirements which fully characterize the conditions of use of systems.

b. Require that threat trends be analyzed to project threat systems characteristics and performance.

c. Require the assessment of system capabilities/limitations, vulnerability, and lethality to be made over the full range of conditions of use.

d. A hierarchy of Army models and supporting integrated data base should be developed as follows:

(1) On an interim basis, establish:

(a) An Army Model Committee with a draft statement of purpose and objectives.

(b) Model resource groups at CAA, CACDA, TRASANA, and AMSAA.

(2) Begin a series of meetings to establish the structure and interfaces of an hierarchical set of models.

(3) Draft an Army model management instrument which formally establishes and defines the authority and responsibilities of:

(a) The Army Model Committee.

(b) The Model Resources Groups (for each level of analysis).

(c) The Data Base Management Group.

e. Maintain and improve the current models until replaced. Each analysis agency should initiate a program of identifying the source and validity of all input data and a program to correct deficiencies in the data by historical research, test and experimentation, or other means.

f. Support the ongoing combined computer procurement action aimed at placing compatible, large, state-of-the-art mainframes at CAA, TRASANA, and CACDA by 1980, study the feasibility of inter-netting the new DPI's at the earliest practicable date, and assess feasibility of including AMSAA in any internetting agreement.

CHAPTER 11

PERSONNEL QUALIFICATIONS

11-1. INTRODUCTION. a. This chapter is concerned with some of the characteristics and qualifications of the persons who comprise the professional staffs of the analysis community of the Army.

b. One reason for examining the characteristics and qualifications of the professional staff was the suggestion, obtained from several sources, that improvements in these areas are greatly needed, especially in certain organizations.

c. It is evident that caution is needed in interpreting data obtained in surveys such as that used in this study. Indeed, the use of surrogate indicators to gain insights into the matter of real interest--to what extent is this community comprised of persons of ability, education, experience, knowledge, vitality, and energy--leaves much to be desired. But nonetheless, one can obtain insights which appear to warrant attention. Some of these are discussed below.

11-2. FINDINGS. a. Fields of Education. One of the features of operations research study and analysis of the waging of war which has historically proven to be beneficial is the use of multi-disciplinary study teams. Initially, there were no persons trained in OR--just physicists, mathematicians, economists, engineers, psychologists, statisticians, and others working together as a team committed to the solution of real problems. As study organizations have grown older, there appears to have been a tendency for them to become less multi-disciplined in orientation. This tendency is illustrated by the data shown in Table 11-1. It is quite apparent that, overall, the mix of educational fields is nicely balanced, but the educational mix within organizations is, in some cases, not so balanced.

Table 11-1. Fields of Education (percentage)

Disciplines	Organization						All Army analysis
	SSI	CAA	CACDA	TRASANA	AMSAA	ARI	
Math, statistics, OR, economics	7	46	61	46	55	6	37
Physics, chem, engineer exp sciences	13	23	26	47	38	4	31
Business, social sciences, psychology, other	80	31	23	8	7	90	32

b. Education Level. The education level of the staff is a frequently used indicator of staff quality. It is not implied that, on a case-by-case basis, the abilities of an individual depends upon the number of degrees held. Rather, use of such an indicator is based on the belief that organizations which are staffed largely by persons who have had the opportunities to enjoy advanced educational experiences are more apt overall to be able to maintain an environment of intellectual independence, scholarship, excellence of analysis, and renewal. The data in Table 11-2 show that overall, the educational level of the professional staff of the analytical community is quite good. Over half, 56 percent, of the staff have earned graduate degrees. The community-wide data shown in Table 11-1 fails to exhibit the extent of variability that exists among the several organizations. To illustrate this variability, the data shown in Table 11-3 are provided. Clearly, some of the organizations are staffed largely by persons holding graduate degrees while others are staffed mainly by persons not holding graduate degrees.

Table 11-2. Percent of Professional Staff Having Education Shown

Education level	Military	Civilian
High school	100	100
Four-year college degree	99	94
Master's degree	68	51
Two or more advanced degrees	10	17

c. Currency of Education. Another indicator of quality is evidence regarding the extent to which the professional staffs continue to take advantage of educational opportunities. The number of years since each staff person last enrolled in a formal "for credit" university course is shown in Table 11-4. The data indicate that the military staffs have been more recently involved in educational programs than civilians. In view of differences in military and civil service educational policies, this is not surprising. There are no objective standards, but it must be especially bothersome that almost half of the civilians have not enrolled in a course for over 5 years while over one-fourth--27 percent--have not taken a course in over 10 years. The judgment is that this is serious evidence of lack of emphasis on the need for continuing professional growth, especially of the civilian staffs.

Table 11-3. Average Number of Advanced Degrees

SECRETARIAT 1.43		HQ DA 1.06		PAGE 1.05	
		HQ TRADOC .80	HQ DARCOM .86		
CAA	.76	TRASANA	.50	AMSAA	.42
USANCA	.64	ADMIN CEN	.66	R&D COMDS	.66
LEA	.33	LOG CEN	.40	READ COMDS	.77
ESC	.63	CACDA	.73	OTHER AGENCIES	.90
SSI	.98	SCHOOLS	.53	BSI	1.0
MILPERCEN	.54				
RDAISA	.09				
ARI	1.40				
USAREC	1.10				
FORSCOM	.86				
USAAC	.86				
INSCOM	.47				

Table 11-4. Number of Years Since Last Formal Education

Years since formal education	Military	Civilian
0-5	65%	52%
5-10	21%	22%
Over 10	14%	26%

d. Professional Experience. Experience, like education, is one of the characteristics which tells something of the nature of the staff of an organization. A staff composed mostly of persons having little experience may lack an institutional outlook and framework of activity conducive to productivity. On the other hand, a staff composed mostly of persons having very many years of experience is perhaps more apt to lack access to recent advances and possibly is also less likely to be receptive to innovations. The ideal distribution of relevant experience levels is not known; however, as seen from the data of Table 11-5, the variability among the organizations involved in Army analysis is large. One cannot but wonder whether the staffs with least average experience have sufficient experience and whether the staffs with most average experience have an overly mature work force.

e. Number of Years in Federal Service. This measure provides additional insight into the extent to which the professional work force of the analysis community is aging. From the interviews and responses to questionnaires, it is evident that some persons suspect that the Army analysis community is not attracting new people. Similarly, they suspect that an overly large part of the staffs are nearing retirement ages. As seen in Table 11-6, the data on years of employment in Federal Service appear not to support those perceptions. Almost 40 percent of the civilians and 25 percent of the military have been in Federal Service less than 10 years. On the other hand, only 15 percent of the civilians and less than 10 percent of the military have over 25 years of service.

Table 11-5. Average Years of Professional Experience

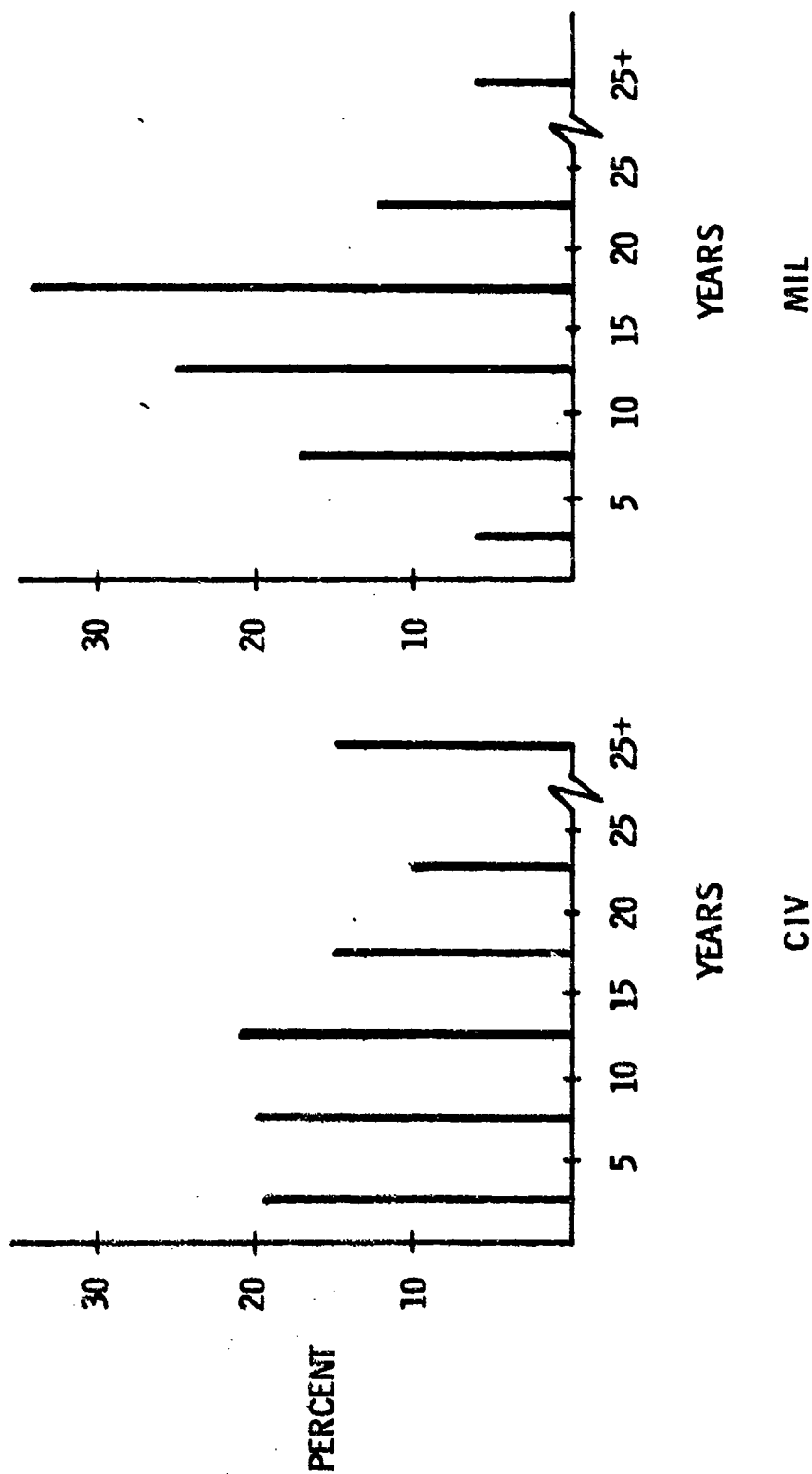
SECRETARIAT 15.1

HQ DA 10.5

PAGE 5.0

	HQ TRADOC <u>1.04</u>	HQ DARCOM <u>6.6</u>
CAA	<u>11.0</u>	
USANCA	<u>14.0</u>	
LEA	<u>16.2</u>	
ESC	<u>13.6</u>	
SSI	<u>14.6</u>	
MILPERCIN	<u>7.1</u>	
RDAISA	<u>11.7</u>	
ARI	<u>12.6</u>	
USAREC	<u>8.2</u>	
FORSCOM	<u>4.1</u>	
USAAC	<u>5.3</u>	
INSCOM	<u>13.5</u>	
	TRASANA <u>10.7</u>	AMSAA <u>7.1</u>
	ADMIN CEN <u>10.2</u>	R&D COMDS <u>12.5</u>
	LOG CEN <u>7.8</u>	READ COMDS <u>10.0</u>
	CACDA <u>10.6</u>	OTHER AGENCIES <u>11.7</u>
	SCHOOLS <u>10.0</u>	BSI <u>16.2</u>

Table 11-6. Number of Years of Federal Service



f. Grade Structure

(1) The distribution of pay grade of civilians and rank of the military of the analysis community of the Army is shown in Table 11-7. Inspection shows both to be as expected. The military analysts are highly concentrated in the ranks of CPT, MAJ, LTC, with a few COL positions and one general officer. Civilians are mostly in pay grades GS-11 to GS-14 with a few GS-15 and a sprinkling of "super grade" positions. Taken overall, grade distribution seems not especially unhealthy, but with perhaps some evidence that grade point ceilings are overly clumping civilians in grades GS-12 and GS-13.

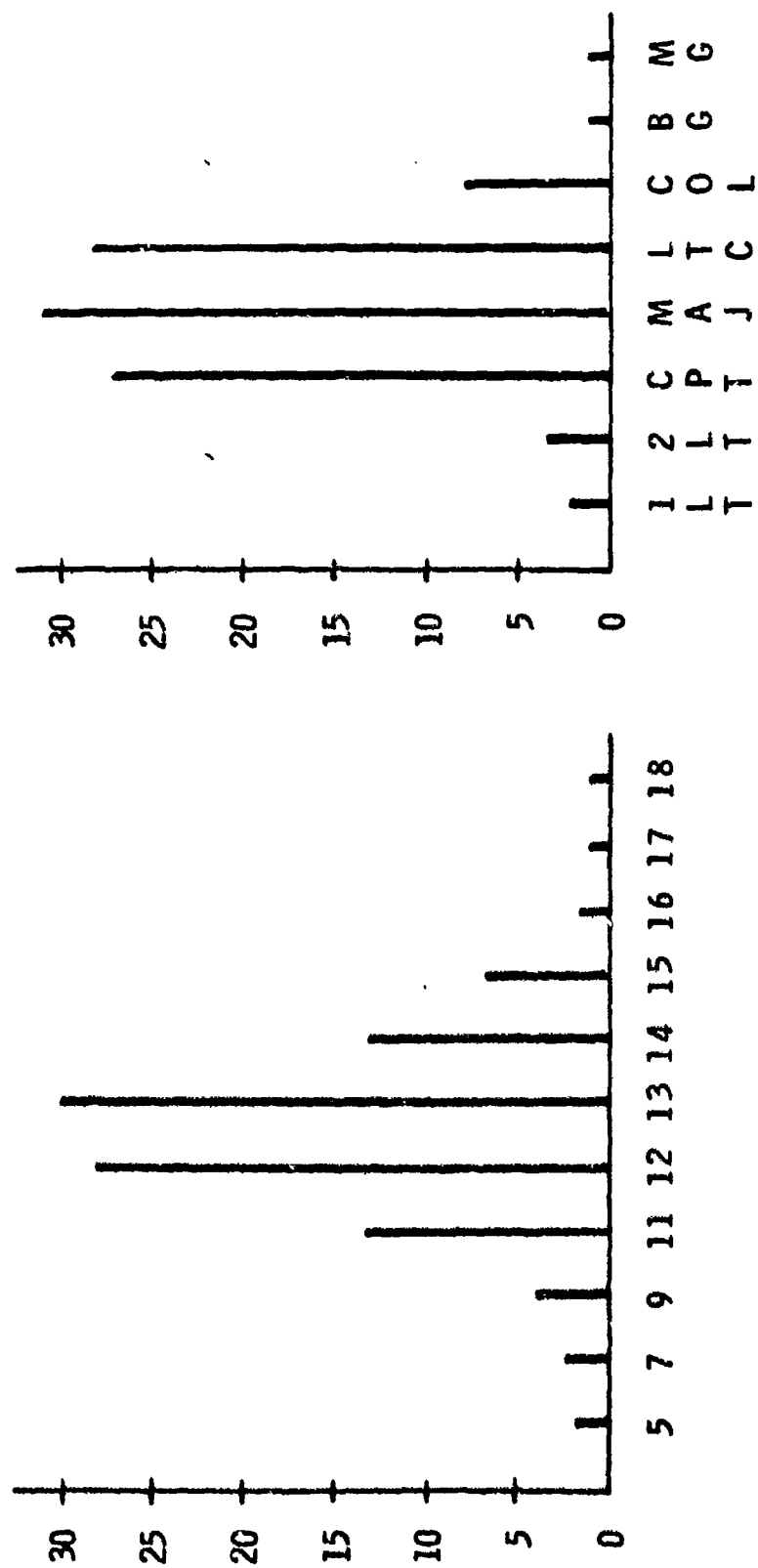
(2) Another way of analyzing grade structure is to examine the average grade levels at the various organizations. This seemed desirable, as it had been suggested that there are large differences resulting from local circumstances. One matter which makes any such comparison difficult is that some analysis organizations (e.g., AMSAA, TRASANA) are staffed almost exclusively by civilians, whereas others (e.g., TRADOC schools) have mostly military analysts and still others (e.g., CAA, CACDA) have a mix of military and civilian analysts. To make comparisons, it is necessary to use some sort of equivalency scale. Despite the perils, such a scale was constructed by members of the Study Group based on their experiences regarding the analysis assignments which would be given to civilian and military analysts. Using that scale, the data of Table 11-8 were calculated. The spread in average grades among the main analysis organizations was found to be small, and the suggestion that large differences exist appears to be--overall--without much basis in fact. Although not shown here, some organizations do have more "super grade" positions than others, but average grades are, on the whole, reasonably comparable.

11-3. PROPOSED ACTIONS. From the foregoing, it seems appropriate to suggest several practices which could result in improvements in the qualifications of the professional staffs. These are as follows:

a. Recruit to Voids. When staff vacancies occur, analysis agencies should seek first rate candidates having relevant advanced degrees, and strong efforts should be made to insure proper balance of skills within each agency.

b. Continue Education. The analysis world is changing. Each analysis organization should encourage each member of its professional staff to continue to grow and maintain currency of knowledge. To the extent permitted by policies and fund availability, agencies should assist the staffs by helping with the costs of continuing education.

Table 11-7. Grade Structure Distribution



CIV

MIL

Table 11-8. Average Grade of Professional Staff

SECRETARIAT 15.7

HQ DA 14.4

PA&E 14.1

	CAA	<u>13.1</u>	HQ TRADOC	<u>12.6</u>	HQ DARCOM	<u>14.1</u>
—	USANCA	<u>13.6</u>	—	TRASANA	<u>12.5</u>	AMSAA <u>12.6</u>
—	LEA	<u>12.7</u>	—	ADMIN CEN	<u>11.8</u>	R&D COMDS <u>12.1</u>
—	ESC	<u>13.1</u>	—	LOG CEN	<u>12.5</u>	READ COMDS <u>12.6</u>
—	SSI	<u>13.8</u>	—	CACDA	<u>12.5</u>	OTHER AGENCIES <u>12.4</u>
—	MILPERCEN	<u>11.7</u>	—	SCHOOLS	<u>11.6</u>	BSI <u>15.0</u>
—	RDAISA	<u>12.2</u>				
—	ARI	<u>12.3</u>				
—	USAREC	<u>11.9</u>				
—	FORSCOM	<u>13.4</u>				
—	USAAC	<u>12.6</u>				
—	INSCOM	<u>12.5</u>				

c. Establish Local Self-help Practices. Each of the analysis organizations being staffed by professionals has a high potential for and should explore "bootstrap" practices which can be very beneficial to members of its analysis staff. Internal courses, seminars, colloquia, and invited guest speaker programs are but a few of the possibilities.

d. Support Intern Programs. A well managed intern program is perhaps the most satisfactory way to insure an inflow of young analyst talent. Each analytical organization should participate in an intern program either by support of a local program or, in the case of smaller activities, by cooperative programs with larger organizations such as TRASANA and AMSAA which do train interns.

CHAPTER 12

QUALITY ASSURANCE

12-1. INTRODUCTION. Many of the findings and proposed actions in other chapters bear on the quality of Army analysis. Obviously, high quality analysis cannot be performed without high quality personnel organized properly with sufficient support. Beyond these matters, though, there are a number of specific practices that affect the quality of analysis, and it is these practices that this chapter addresses. A more complete treatment is found in Appendix L.

12-2. FINDINGS. a. Atmosphere for Intellectual Independence. The Study Group finds that some analysis activities do not have an atmosphere conducive to intellectual independence and professional development and hence suffer degraded quality of work. This is evidenced by some activities having little or no self-initiated projects usually coupled with a low level of effort in methodology development projects. Such organizations tend to be highly customer oriented and prize responsiveness above all other work attributes. In some instances, there is no agency identification with the reports of the work, and commonly the authors are not identified.

b. Formal Review Process. Each of the major analysis agencies maintains internal, formal procedures for reviewing the quality of their work. There are no formal procedures for quality control review outside of the various activities.

12-3. PROPOSED SOLUTIONS. a. Atmosphere for Intellectual Independence

(1) Objective. All analysis activities should maintain an atmosphere for intellectual independence.

(2) Proposed Solution

(a) Assure that a reasonable portion of the work program (at least 10 percent) is self-initiated.

(b) Assure that a reasonable portion of resources (at least 15 percent) is used to develop/upgrade methodology.

(c) Preserve the integrity/identity of reports of study.

i. Assure that agency/activity label is affixed to products.

2. Indicate principal authors and significant contributors to study products.

b. Formal Review Process

(1) Objective. Strengthen formal review of analytical products and agencies.

(2) Proposed Solutions

(a) Continue current practice of internal prepublication peer review where it exists. Initiate where it does not exist.

(b) Conduct formal, external agency peer review on sampled basis. Study Program Management Office could administer this program by selecting reports to be reviewed and assigning them to reviewers.

(c) Study sponsors feed back to study doers the strengths, weaknesses, utility, and implementation of study results.

(d) Conduct periodic reviews of study agencies by a distinguished Board of Visitors.

(e) Hold periodic conferences of the senior members of the analytical community to identify problems within the community and suggest corrective actions.

(f) Use the Army Operations Research Symposium as an active vehicle to hasten communication, exchange studies, and recognize quality work.

12-4. PROPOSED ACTIONS. a. Agencies and MACOM should insure that programs are partly self-initiated (at least 10 percent) and provide adequate resources (at least 15 percent of program) for methodology development.

b. Assure that agency/activity label is affixed to study reports and that principal authors and significant contributors are identified by name on the reports.

c. Continue (or initiate) prepublication internal peer review.

d. Institute program of sampled, external peer review. SPNO should administer.

e. Institute measures for study sponsor to feed back to study doer information on strengths, weaknesses, utility of study products.

f. Establish a distinguished Board of Visitors with members from both within and outside the Army to periodically review analytical organizations.

g. Hold periodic conferences of the senior members of the Army analytical community to identify problems within the community and suggest corrective action.

h. Orient the Army Operations Research Symposium so as to foster communication, exchange studies, and, especially, recognize work of high quality.

CHAPTER 13

USE OF OPERATIONS RESEARCH IN OPERATIONAL COMMANDS

13-1. INTRODUCTION. Operations research got its beginning in World War II solving operational problems, e.g., the defense of Britain against German air raids. During the Korean War, the US Army employed analysts from the then recently established Johns Hopkins University Operations Research Office (ORO) not only in the US, but in the theater as well. Later, ORO established about a five man office in USAREUR at Heidelberg, Germany, but it was disbanded after some years. The Air Force earlier had an operations analysis office at USAFE in Wiesbaden, Germany and most other tactical commands around the world including TAC and PACAF, both of which are still in operation, as well as SAC, and the Navy has continuously sent analysts to sea with the fleet and maintained an element at CINCPAC to work on operational problems. How does this compare with the current situation in the operational commands of the Army?

13-2. FINDINGS. a. United States Army Europe (USAREUR)

(1) Organization. In the headquarters of the Resource Review and Analysis Division, Office of the Deputy Chief of Staff, Resource Management, composed of four civilians and two officers, is contained the bulk of the analytic talent. There is but one other analyst in the headquarters, a civilian located in the Force Modernization Division, Deputy Chief of Staff, Operations. Seven analysts are assigned to organizations subordinate to HQ USAREUR, one to V Corps, three to VII Corps, and three to 21st SUPCOM.

(a) DCS for Operations

1. What was once a two man analytical operation with one of the two analysts reporting to the DCS has degraded into a one man operation, where this analyst is about to become the Deputy Chief of the recently formed Force Modernization Division. (Although the cause for the reduction is unknown, it could have been underutilization and/or lack of participatory support within the command--there is certainly no lack of problems.) The present utilization, if it prevails, can at best be considered a compromise for the one analyst remaining--he will have every opportunity to channel his capabilities in a specific area, but at the same time, will not necessarily be available to OPS as a whole to assist in other key issues as they might arise.

2. Prior to the present possible change in assignment, the civilian analyst in DCSOPS was being carried on the USAREUR organization chart as the ammo officer in the Requirements System Integration Division. Much work has been done on ammunition rates--basic load, where stocked in both peacetime and wartime, and distribution--and there is still much interest. Disconcerting is the fact that senior commanders were recently "polled" to determine the tank basic load.

(b) Resource Review and Analysis Division, DCS for Resource Management. This reasonably sized group is responsible for conducting cost and economic analysis and providing analytic support to the program and budgeting process. For example, they determine the impact on any currency revaluation on the budget (and cost of living) and perform cost benefit analyses on initiatives such as the repair of 2 1/2 ton trucks at Julich, the storage of supplies in Luxembourg, and turning over the Zweibrucken Huttenheim (ZH) part of the central pipeline. This group has developed a methodology for relating funding levels to readiness (which has been briefed in the Pentagon), costing models for budgeting people using a regression technique for cost factors, and decisions analysis and prioritization techniques. This group has a minicomputer (IBM 5100) to support their analysis, and access to several other Wang minicomputers. Analysis requiring a large-scale computer presents a problem, since software support and machine time are not normally available from the IBM 360-65 supporting the headquarters. The WWMCCS computer can be utilized provided the users possess a TOP SECRET clearance.

(2) Recent Activities. The current annually conducted HQDA OMNIBUS Study is an outgrowth of the USAREUR initiated USAREUR Capability Study (a one-time, in-house war game) begun in 1974 to study the impact of the Nunn Amendment. Another example was provided when USAREUR wanted to reorganize its aviation assets--a battalion concept was developed by USAREUR, gamed, and then field tested by the 3d Infantry Division. Two others, also force structure related, Nuclear '75 and Chem '76, could have used more analytic help than was resident. There is often too little time and too few people; thus, much analysis has been highly subjective.

(3) Battle Simulations. Battle simulations developed with the help of the analysts have been used by units in the field both for staff training and for evaluating battle positions. PEGASUS, out of CATRADA, has been used by the 8th Infantry Division for the former (a test will be conducted this year wherein ARI will measure the difference in staff proficiency brought about by training through the use of PEGASUS) and BATTLE, out of TRANSANA, by V Corps Battalion commanders for the latter.

(4) Deficiencies/Recommendations. Although staffing for Resource Management and/or the Comptroller is deemed sufficient, the Study Group believes that not enough operational analysis is being conducted in USAREUR when there should be an abundance of data and many opportunities to assist the commander. Studies done mostly in the CONUS for USAREUR are believed influenced by the organization doing the study (e.g., Concepts Analysis Agency) and the flavor is different than if done in the field.

b. United States Army Forces Command (FORSCOM)

(1) There are 15 spaces authorized to meet the current analytic requirements of the headquarters. There are at present five officers in the Program Analysis and Evaluation Office, two officers in the ODCSOPS, and seven civilians in the ODCS Comptroller.

(2) The analysts currently authorized do conduct, on a periodic and ad hoc basis, staff studies/reviews in areas such as R&D priorities, Force Modernization Requirements, Training Readiness Requirements, Full Time Reserve Component Manning, and Readiness Reporting, all considered routine and of the staff study type. Historically, FORSCOM study efforts have been responsive to DA, other MACOM requests for information, or in-house initiatives for determining and managing resource requirements.

(3) At this writing, FORSCOM has no organizational unit or personnel dedicated to or directly involved with sophisticated quantitative analysis. It is anticipated, however, that the PA and E Office will be reorganized under the Chief of Staff.

(4) The Study Group decided to make no recommendation pending completion of the ongoing examinations within FORSCOM.

c. United States Army Communications Command (ACC)

(1) The Systems Analysis Branch, Systems and Economic Analysis Division, Office of the Comptroller, contains the ten ORSA spaces authorized in the headquarters. All are civilian (with no military spaces authorized) and are presently staffed at seven. They are responsible for determining the effectiveness of current communications systems for the Command. This group also makes performance projections for systems under development under various conditions, primarily through simulation. There is also a commitment to the analysis of resource utilization both in the development of Command Resource Baseline and in large scale Cost Analysis.

(2) The lack of a large scale data base for cost and effectiveness analyses (attributed to understaffing) and inadequate response time for computerized models are a current handicap to their work. These problems should be alleviated by recruiting actions already underway and the installation of a remote terminal this fall.

13-3. PROPOSED IMPROVEMENTS. a. Objective. Increase analysis capability in operational commands, especially USAREUR.

b. Proposed Solution

(1) The proper sized nucleus for a highly productive analytical team would be four or five professionals; therefore a team of not less than four or more than eight should be established at HQ, USAREUR in addition to the analysts located in ODCSRM. This team, under its civilian head, should preferably report to the Commander, but be assigned no lower than the DCSOPS. Tasking should be limited to the Commander and/or his agent, the DCSOPS. The length of the tour should be three years, with five the maximum exception and the quality of those selected should be closely controlled by the DUSA(OR) and/or the Technical Advisor, DCSOPS in conjunction with other senior analysts in the Department of the Army. The selection should be competitive with candidates coming primarily from the major analysis agencies--CAA, TRASANA, CACDA, and AMSAA. The incentive would be the opportunity to be educated and at the same time work on Army operational problems with a high probability of seeing immediate results. All work done would be documented and reported to the sponsoring organization and/or the Commander and/or his agent, the DCSOPS. The incremental cost is estimated to be approximately \$55 thousand per man year including support costs, travel, and quarters allowance for a mix of GS-13 through supergrade.

(2) An alternative to the above concept would differ in that it would place a four-man cell in each of the two corps but be identical in all other respects to the concept above.

13-4. PROPOSED ACTION. Initiate discussions with all interested parties with the goal of establishing an analytical activity in USAREUR in general accordance with the conceptual scheme by end FY 79.

CHAPTER 14

RESOURCE REALLOCATIONS

14-1. INTRODUCTION. This chapter addresses the reallocation of resources implied in the actions proposed in the preceding chapters. It shows the proposed actions to be feasible from a resources standpoint. Also, as a matter of convenience, it collects the rationale for the proposed reallocation. This rationale is, of course, in large part redundant to discussions contained elsewhere in the report. It is repeated here since it is so central to the question of whether the proposed reallocation is warranted.

14-2. THE BASIC ASSUMPTION. In paragraph 1-3 of the Introduction to the Report the following assumption was stated: "The personnel resources and funds made available for conduct of Army studies and analyses will not be substantially increased in the foreseeable future and may, in fact, be decreased." That assumption, made at the outset of the review, seemed even more valid at the completion of it as a consequence of actions taken by the Congress during the time when the review was being conducted. The effect of the assumption was to chill consideration of any options which would require resource additions and to force concern for sources of resources to support the improvements called for in the review.

14-3. RESOURCE REQUIREMENTS. The review concentrated primarily on improvements in relationships, procedures, responsibilities, and similar matters which could result in productivity increases without resource increases. Although it sought to work within a constrained resource limit overall it did propose actions which would be possible only if resources are added to OCSA, CAA and the analysis organizations at Ft. Leavenworth. The added resources are summarized below:

OCSA	-	4-8	Spaces	
CAA	-	25	Spaces	+ \$6.0 Mil for contracts
Ft. Leavenworth	-	50-60	Spaces	
Total		79-93	Spaces	+ \$6.0 Mil

(Spaces are both professional and support)

14-4. ALTERNATIVE WAYS TO SUPPORT THE IMPROVEMENTS. The Study Group considered three alternative ways to provide resources to cover the requirements presented above. These are discussed below.

a. Option 1 - Add Resources. The advantages of this approach are that it would be relatively painless, at least to the studies community, and would avoid the arguments and controversies regarding which organizations could best afford to be reduced. The disadvantages are that such an approach would be clearly contrary to the mood of Congress which intends a reduction rather than an increase in studies and analysis outlays. It also would require reductions of Army efforts outside the studies communities, would result in organizations having resources to cover work programs that would have been transferred away, and would reflect an Army inability to take decisive actions to align resources and needs. Altogether the Study Group could not favor this alternative.

b.. Option 2 - Tax the Community. In this alternative, all of the HQDA contract funds (say about \$3.5M in a normal year but only \$1.7M in FY 79) would be transferred to CAA and a reduction of spaces of about 4 to 5 percent would be levied on the analysis community described in Chapter 2 to provide the required spaces and resource equivalents for additional contract funds. This approach would avoid overly large loss of capability at any of the analysis organizations and possibly could be effected at least in part by failing to replace attrition losses, thus minimizing problems of personnel turbulence. It, of course, could be accomplished without increases in studies and analysis resources overall. On the other hand, it would fail to respond to the fact that certain of the organizations are better able to accept reductions than others and--more importantly--it would result in a situation where missions are transferred but resources are not with confusions resulting regarding who will do what. Option 2, like Option 1, would reflect an Army inability to take decisive actions to align resources and needs, and, overall, the Study Group would not favor the approach of Option 2.

c. Option 3 - Selective Reallocations. This option, like Option 2, would move HQDA contract money to CAA. In addition, it would make significant reductions in certain organizations and re-allocate the resources to the gaining organizations. The advantages of Option 3 are that it, like Option 2, would be consistent with the intent of Congress and would not require additional resources. It also would result in a clear alignment of the mission and resources of analysis organizations and it would demonstrate that the Army is willing to take decisive action to modify the staffing of organizations as their missions are changed over time. The disadvantages are that the losing organizations would quite naturally be expected to bring forth arguments to the effect that they have unique and vital capabilities whose reduction would imperil the Army's capacity to respond to its global

responsibilities. Option 3 would force a direct facing of whether the improvements are, as the Study Group judges, worth the price. The Study Group favors Option 3.

14-5. WHAT TO CUT. If the improvement actions proposed by the Study Group are approved, and if the Study Group proposed approach to supporting the improvements is accepted, then there arises the question of which organizations should be cut. This nettle is now to be grasped.

a. Logistics Evaluation Agency. It will be recalled that one of the proposals is that the analysis of logistics matters be significantly improved by more fully integrating logistics considerations in the force level studies done at CAA. To this end, the review proposed additions of spaces and contract dollars to CAA. The Study Group reasons, that when this is done, essentially all of the study portion of the work done at the Logistics Evaluation Agency work could effectively be assigned to CAA, and proposes an arrangement wherein DCSLOG would have a line-of-credit at CAA to get the support for this work. As a consequence it would not be unreasonable to decrement LEA by up to about 20 spaces, the number now involved in studies plus some support spaces.

b. Army Research Institute. A second major concern of the Study Group was that the capability to do personnel and manpower studies be improved. The proposed actions involved modification of the statement of the mission of ARI and the transfer of spaces and dollars from ARI to CAA. The proposal to modify the ARI mission resulted from the belief that some of the people-related studies and research would both benefit from very close coupling with the other. But some of ARI's products possibly would be of higher value if they were not limited to "research" when, if coupled with more "analysis," they could contribute more directly to the solution of important and pressing problems of the Army. Similarly, some of the ARI research might be focused on areas of information gaps where new knowledge would have payoff. So, having ARI to do selected studies and analysis as well as research quite possibly would improve the productivity of the organization as well as give the Army a needed source of studies. But the institutional character of ARI is one which could not be quickly transformed to one having the analysis orientation necessary to activities such as design and operation of sophisticated manpower models and integration of personnel and manpower factors into force level studies. The best approach to doing this work would be to build upon the analysis capability at CAA. We should increase the scope of the CAA work program and expand the CAA force models to accommodate considerations of these personnel/manpower matters. Contractor assistance to CAA would be proper. The Study Group

believes that it would be appropriate to transfer about 20 spaces and about \$2M from ARI to CAA to support this concept of operations. This approach would continue to use all of the resources heretofore used in the manpower/personnel area to do work in that area. It also would add other resources to this area and seek to increase their output by better integration of a part of the traditional ARI community with the broader analysis community.

c. Engineer Studies Center. The third major increment proposed by the Study Group was the approximately 50 professional spaces that should be placed at Ft. Leavenworth. Part of these could come from the spaces taken from LEA and ARI since not all of these would be required by CAA to perform the same missions. But overall, the plus-up could not be directly related to a drawdown elsewhere, so one is forced to examine "least hurt" options. The review team concluded that the Engineer Studies Center is the best candidate. This conclusion was difficult because ESC, formerly ESG, formerly ESSG, continues in the 1970s the reputation that it enjoyed during the 1950s and 1960s of being able to produce quality work within the limitations of its areas of expertise. But during the decades since ESSG was established, the analysis capabilities of the remainder of the Army have changed in major ways, and the wisdom of attempting to support ESC as an additional, small, more-or-less general purpose analysis organization seems to be increasingly questionable. The work program of ESC during the past few years shows, in the judgment of the Study Group, that the resources at ESC--while fully utilized on fruitful activities--are well above the minimum required to provide the staff planning analyses required by the Chief of Engineers, and, in fact, have been used to provide assistance to a variety of other organizations. Doubtless, this assistance has been helpful, but, on balance it seems to the Study Group that a major reduction of ESC is now in order, probably one of about 36 spaces. This well might have the effect of changing ESC from a minor independent study center to a staff element of the Chief of Engineers, but we believe it still would have resources sufficient to accomplish the planning analyses which are the essential core of its current activities.

d. The HQDA Staff. The proposal to expand the Study Management Office, OCSA, from the current three persons up to about nine professionals could be supported by corresponding reduction elsewhere in the HQDA, although no transfer of function is involved. Spaces could come from analysis oriented activities in OUSA, ODCSOPS, and ODCSRDA. Alternatively, spaces could be added to HQDA to accommodate the new function.

e. Summary of Proposed Reductions. The numbers mentioned above are the same as shown below:

Source	Spaces	Funds
HQDA	4-8	\$3.5 M11
LEA	Up to 20	
ESC	Up to 36	
ARI	Up to 20	\$2.0 M11
Total	Up to 84	\$5.5 M11

The totals above about balance the totals shown in para 14-3 above. That, of course, was the objective.

CHAPTER 15

PROPOSED ACTIONS

15-1. INTRODUCTION. This chapter presents a summary of actions proposed as a result of the study.

15-2. ARMY STUDY PROGRAM AND STUDY SYSTEM. a. Establish an Army Study Council to review and approve study guidance and programs. Council should be chaired by VCSA and be composed of HQDA principals, TRADOC and DARCOM commanders, and representatives of other MACOM.

b. Establish a Study Program Allocation Committee to review and balance programs and recommend to Army Study Council. The committee should be chaired by Director of Management (OCSA) with appropriate HQDA and MACOM representation.

c. Expand the mission and resources of the current Study Management Office (SMO) to form a Study Program Management Office (SPMO).

(1) Increase the office size to 6 to 10 professionals from the present 3. The office should have a super grade chief reporting to the Director of Management.

(2) SPMO should execute all current SMO functions plus assist in development of guidance, serve as secretariat for Study Council and Program Allocation Committee, and serve as functional program manager.

d. Require the budget process to capture study data on-line. Eliminate program elements for HQDA and TRADOC studies and include these funds in budgets of operating agencies. Revise AR 5-5 to align definition of studies with OSD and Congressional requirements.

15-3. STUDIES OF FORCES AND CERTAIN FORCE-WIDE ISSUES. a. Define integrated family of strategic and force level studies and the interface with combat developments studies. Require that the studies be performed and the results provided in form suitable for use in a hierarchy of studies using a hierarchy of models.

b. Increase CAA capability to analyze all aspects of forces (e.g., operations, structure, logistics, manpower, personnel) and to support all elements of HQDA, especially in conducting analysis of Army-wide manpower and personnel issues. Add personnel and

contract resources to CAA. Assign Commander, CAA, to Director of Army Staff. Provide HQDA principals a "line-of-credit" to CAA capability.

15-4. STUDIES OF COMBINED ARMS AND SUPPORT ORGANIZATIONS--
BRIGADES, DIVISIONS, AND CORPS. a. Increase analytical spaces at CACDA to about 150 professionals. The Study Group recommends these be concentrated in a TRASANA field office in direct support to CACDA.

b. Initiate development of techniques suitable to analyze the design of alternative brigades, divisions, and corps.

c. Establish actual interface of CACDA with TRADOC centers and schools, TRASANA, and CAA. This is essential to provide the link-ages necessary to mission accomplishment of these agencies.

d. Require development and use of major organization models be coordinated with hierarchy of Army models. Require that command group training simulations be part of the hierarchy.

15-5. STUDIES OF FUNCTIONAL SYSTEMS, UNITS, AND REQUIREMENTS FOR ITEM SYSTEMS. a. Fill the SC 49 authorized positions in TRADOC schools and centers with qualified SC 49 officers. Plans should be developed for improving the quantity and utilization of SC 49 officers.

b. Place more emphasis on analysis of the control functional area.

c. Establish a continuing study program in each functional area to underpin item level system requirements.

d. Increase the portion of TRADOC analysis resources that are applied to analyses of training. Reduce effort on COEA.

e. Require development and use of models of functional systems to be coordinated with Army hierarchy of models.

15-6. STUDIES OF ITEM LEVEL SYSTEMS. a. TRADOC should describe and define a full set of conditions of usage, incorporate them into requirements documents. HQDA should incorporate into DCPs as they are updated.

b. DARCOM should develop data regarding the performance of systems under the real conditions of usage.

c. DARCOM, especially AMSAA, should develop capability to develop data regarding performance of C³I systems under expected conditions of usage.

d. DARCOM should monitor efficiency of ongoing efforts to remedy problems in developing vulnerability data and take appropriate action.

e. DARCOM should develop data regarding the manpower/personnel ramifications of item systems.

15-7. MODELS, DATA, AND DATA BASES. a. TRADOC should continue efforts to produce statements of requirements which fully characterize the conditions of use of systems.

b. Require that threat trends be analyzed to project threat systems characteristics and performance.

c. Require the assessment of system capabilities/limitations, vulnerability, and lethality to be made over the full range of conditions of use.

d. A hierarchy of Army models and supporting integrated data base should be developed as follows:

(1) On an interim basis, establish:

(a) An Army Model Committee with a draft statement of purpose and objectives.

(b) Model Resource Groups at CAA, CACDA, TRASANA, and AMSAA

(2) Begin a series of meetings to establish the structure and interfaces of an hierarchical set of models.

(3) Draft an Army model management instrument which formally establishes and defines the authority and responsibilities of:

(a) The Army Model Committee.

(b) The Model Resources Groups (for each level of analysis).

(c) The Data Base Management Group.

e. Maintain and improve the current models until replaced.

f. Support the ongoing combined computer procurement action aimed at placing compatible, large, state-of-the-art mainframes at CAA, TRASANA, and CACDA by 1980, study the feasibility of inter-netting the DPIs at the earliest practicable date, and assess feasibility of including AMSAA in any internetting arrangement.

15-8. PERSONNEL QUALIFICATIONS. a. When staff vacancies occur, analysis agencies should seek first-rate candidates having relevant advanced degrees, and strong efforts should be made to insure proper balance of skills within each agency.

b. Each analysis organization should encourage each member of its professional staff to continue to grow and maintain currency of knowledge. To the extent permitted by policies and fund availability, agencies should assist the staffs by helping with the costs of continuing education.

c. Each of the analysis organizations being staffed by professionals has a high potential for and should explore "bootstrap" practices which can be very beneficial to members of its analysis staff. Internal courses, seminars, colloquia, and invited guest speaker programs are but a few of the possibilities.

d. Each analytical organization should participate in an intern program either by support of a local program or, in the case of smaller activities, by cooperative programs with larger organizations such as TRASANA and AMSAA which do train interns.

15-9. QUALITY ASSURANCE. a. Agencies and MACOM should insure that programs are partly self-initiated (at least 10 percent) and provide adequate resources (at least 15 percent of program) for methodology development.

b. Assure that agency/activity label is affixed to study reports and that principal authors and significant contributors are identified by name on the reports.

c. Continue (or initiate) prepublication internal peer review.

d. Institute program of sampled, external peer review. SPNO should administer.

e. Institute measures for study sponsor to feed back to study doer information on strengths, weaknesses, utility of study products.

f. Each major analytical organization should make use of a distinguished Board of Visitors, with members from both within and outside the Army to periodically review its work program and operations.

g. Hold periodic conferences of the senior members of the Army analytical community to identify problems within the community and suggest corrective action.

h. Orient the Army Operations Research Symposium so as to foster communication, exchange studies, and, especially, recognize work of high quality.

15-10. USE OF OPERATIONS RESEARCH IN OPERATIONAL COMMANDS. Initiate discussions with all interested parties with the goal of establishing an analytical activity in USAREUR in general accordance with the conceptual scheme by end FY 79.

APPENDIX A
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Appendix F.

7. SUPPORT PERSONNEL--support was received from personnel in the
US Army Concepts Analysis Agency offices as follows:

Project Planning and Control Office
Word Processing Center
Graphics Branch

APPENDIX B

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